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ON THE PATHOLOGICAL ANATOMY OF SENSORY APHASIA.*

By R. W. AMIDON, A.M., M.D.,
NEW YORK.

CASE I.—*Personal Observation.*—Mary A. S., aged sixty, married, a native of England, and a housekeeper, consulted me June 10, 1882.

She had been perfectly well up to the time of her menopause, nine years before. Since then she had been subject to the hot and cold flashes, various other paræsthesiæ, and the discomforts of flatulent dyspepsia incident to that period.

April 29th (six weeks before I saw her) she was seized with a bad headache, worse on the left side. The headache and vertigo continued for three days, and then she became "flighty" and incoherent, and has remained so since. Her dyspepsia became worse after the nervous attack, and frequent vomiting was superadded to the flatulence; she also became very excitable.

Her daughter thought she never had any delusions.

On the first examination I found the patient very excitable. The facies was intelligent and inquiring. The right palpebral fissure was smaller and the right pupil was larger than the left. The tongue deviated slightly to the right. The right hand was not so much stronger than the left as it should have been, and was slightly tremulous. There had never been any tendency to use the left hand instead of the right, which she used as well as ever. There was never any weakness or dragging of the right lower extremity. In short, there were no marked disturbances of motility, either paralysis or spasm. The fundis oculi was normal, and the acuity

* Read before the New York Academy of Medicine, November 6, 1884.

of vision, as far as could be ascertained, perfect, though her daughter said her mother used to darn white stockings with black yarn.

It was a perversion of speech which most attracted my attention. The disturbance seemed at first a sort of incoherence; but a short observation demonstrated the fact that it was *only* when answering questions that the patient spoke incorrectly. Knowing the patient's peculiarity, the history of the case had been obtained from a very intelligent daughter, and then, to test the patient's speech, she was asked: "What is your name?" To which she replied interrogatively: "Is it Mr. —— that you are talking about?" and that same answer generally followed that question. When asked her age, an equally inapropos answer invariably followed. When asked to name different objects about her, she usually designated them by numerals. The object would have to be brought to her attention especially before she would notice it at all. She could not count or say her letters. She used no long words, and very few nouns.

With all these peculiarities of speech, it was soon seen that, when she spoke of her own accord, her remarks were connected and perfectly intelligible. She voluntarily described to me, in correct language, how much she suffered from headache, and also complained repeatedly of the functional disturbances of the change of life, the hot and cold flashes, the flatulent dyspepsia, and the borborygmi, which latter, by their activity and their location, made her and her friends believe that an animal of some sort lived in her left lumbar region. She called her daughter by name, and knew all her friends, except her husband. She repeatedly asked who he was, and why he was about, etc. Her son she seemed to know; but she always called him "father." As a general thing, she would not call things by wrong names unless questioned. Her hearing was apparently of normal acuity, as she started at slight noises, and her attention was easily attracted. Many noises, particularly those of articulate speech, were undoubtedly to her unintelligible sounds, because her manner and blank expression, when talked to or questioned, showed how little she understood. Occasionally, when asked by her daughter to help her about the house (sweep or make beds), she would answer: "Oh, yes, I'll do it; anything to help you"; but, as a general thing, understood nothing said to her unless it was emphasized by explanatory gestures. Gestures she understood perfectly. When induced to read aloud, she spun out a perfectly sense-

less jargon of words. She very seldom could tell the time of day by a watch or clock. She could not be trusted to go about the streets alone, as their numbers and that of her house were illegible to her, and also she could not answer questions intelligibly. She could not write from dictation, and never could be induced to put her thoughts or wants in writing, being in the habit of writing very little when in health. She was repeatedly seen to take things—knife, fork, broom, etc.—by the wrong end. She preserved her appreciation of music, and would sing correctly.

From the onset of her trouble she was subject to periodical attacks of a spasmodic nature, generally occurring about once a month. They consisted of a cry, a drawing up of the right hand, and a drawing of the mouth to the right. According to the daughter, this period lasted several minutes, when general convulsions ensued, lasting a longer time. During the fit, involuntary evacuations sometimes occurred. The patient said that the right hand was numb before the spell.

February 15, 1884, she was seized with convulsions at seven in the evening, which constantly recurred until eleven the next morning. Then she fell into a comatose state, characterized by very forced respiration, which lasted until seven in the evening of February 16, 1884, when she died, fifteen months after her first attack.

For a description of her final illness I have to depend entirely on the family, and they say that during the last twenty-four hours she passed *very little* urine.

The woman, dying without medical attendance, became a coroner's case, and I was allowed to assist at the autopsy. The kidneys were the seat of quite advanced interstitial changes, being rather small, and having atrophied cortices. The right cerebral hemisphere was normal.

The surface of the left hemisphere, on being exposed, was seen to be the seat of an irregular depression, which was shown, on removal of the brain from the skull, to be caused by a destruction of the inferior parietal lobule, the entire angular gyrus, the posterior three fourths of the first temporal convolution, the upper and posterior half of the second temporal convolution, and a part of the second occipital convolution. (See Fig. 1.)

The depressed area contained a tenacious mass of tortuous blood-vessels, and folds of opaque and thickened pia mater. The rest of the cortex, including the convolutions of the insula, was normal.

The large cerebral arteries were the seat of extensive soft atheromatous changes, arranged in many places in the form of rings encircling the vessel, and in some localities markedly encroaching upon the lumen of the vessel. The terminal branch of the left Sylvian artery was occluded by a thrombus.

CASE II.*—A male of sixty-two had for six years had frequent attacks of vertigo, which lasted several seconds.

In March, 1882, he was suddenly seized while at supper. His wife noticed that he became pallid, his head drooped, and he remained motionless. She spoke to him in vain, and he fumbled automatically with his napkin.

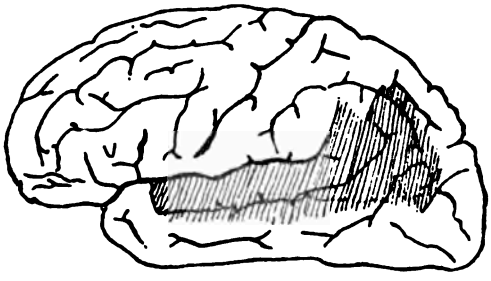

FIG 1.

He dragged his right leg a little in walking. He was speechless; he recognized persons and objects, and also their names when they were pronounced before him. The hemiplegia disappeared, but the aphasia remained unchanged.

He entered Hôpital St. Louis, November 11, 1882. His understanding of words seemed greatly compromised. Often he seemed to understand, but his replies, spoken or gestured, were rarely satisfactory. To the question, "How are you?" he always replied: "Pretty well; a little better." He could not find the names of things which were shown him. If he was told, he made an affirmative sign and said: "Yes, that is so." He could not tell his name, but if it was pronounced he said: "That's so; that's well." When tired with attempts to talk, he swore in German; but he was aphasic in that tongue, too. His writing was a shapeless scribble. When asked to protrude his tongue, he curled it up on the roof of his mouth.

On admission there was no marked hemiplegia, no facial

* "Contribution à l'étude de l'aphasie," par M. F. Balzer, "Gaz. méd. de Paris," 1884, ix., 97.

deviation, no disturbances of sensibility, and the reflexes were only a little exaggerated. His general health was good. Day and night he was in a state of incessant agitation.

Later in March his speech was more embarrassed; he became more melancholic.

July 2, 1883, he died of congestion of the lungs.

On autopsy, the heart was found loaded with adipose tissue. There were two small, very superficial yellow patches, scarcely a millimetre square, at the upper and posterior angle of the left third frontal convolution, right next to the fissure which separates it from the second frontal convolution.

An immense patch of softening occupied nearly all the first temporal convolution, the parallel fissure, and the upper part of the second temporal convolution. Backward it destroyed above the lower part of the inferior parietal lobule and the sigmoid gyrus, and below the posterior part of the second temporal convolution. (See Fig. 2.) The frontal con-

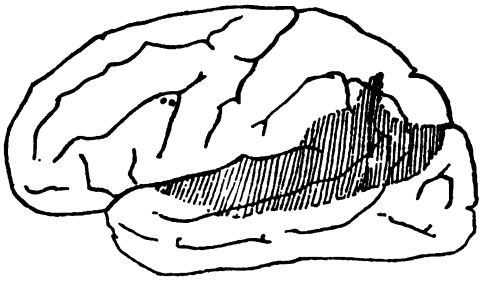

FIG. 2.

volutions and central ganglia were intact. The softening occupied the region supplied by the fourth branch of the Sylvian artery, which was calcified throughout, and completely obliterated at the border of the yellow patch.

CASE III.*—A waitress, aged twenty-four, with previous good health, had coughed for four months. On October 12, 1881, she suddenly became speechless. She immediately entered the service of M. d'Heilly at Hôpital Saint Antoine.

The summit of each lung was found in the second stage of tuberculosis. The heart was normal. The temperature 38·5° C. To all questions put to her she would repeat five

* "Note sur un cas de cécité et de surdité verbales," par MM. d'Heilly et Chantemesse, Prog. Méd., 1883, xi., 22–25.

or six times, with different intonations, "Because, because, because." Sensibility and motility seemed perfectly intact.

October 15th, in answer to a question, she answered: "Thank you, sir, I am better." She looked very intently at the speaker, but the words seemed to wake in her no image, no remembrance. When told to put her hand on her head she hesitated an instant and appeared to be trying to remember something, but she remained motionless. When the command was accompanied by a suggestive gesture, she quickly obeyed. Hearing and vision were both preserved. Her power of calculation seemed preserved, as she could play *écarté* skillfully, making no errors as to color or value.

When asked, she called her knife, tumbler, food, wine, and plate each "du plan." When an orange was held out to her she answered all questions "Yes, sir," and reached for the orange. Once when her soles were tickled she said:

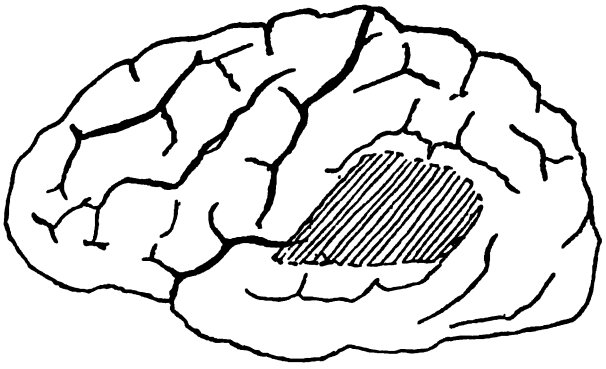

FIG. 3.

"Please don't, sir." She could not copy, write from dictation, nor read. Smell, taste, and acuity of vision were not very completely studied.

She died, November 3d, of marasmus.

There was found, on autopsy, a thrombosis of the fourth branch of the left Sylvian artery. There was softening of the territory supplied by the obstructed vessel, the upper posterior half of the first temporo-sphenoidal convolution, most of the inferior parietal lobule, the supra-marginal gyrus, and some of the sigmoid gyrus. (See Fig. 3.) The softening affected only the cortex, and, on section, was seen to implicate only the extreme posterior, hidden part of the insula.

CASE IV.*—Male, fifty-two, had "brain fever" when a child. Had also repeated attacks of inflammatory rheumatism and gout, and was subject to flatulent dyspepsia.

On February 1, 1878, was exposed to cold and thoroughly chilled. February 11th, he was found lying on a lounge talking unintelligibly. Was conscious, but unable to answer questions except by a confused muttering, and there was an incomplete right hemiplegia and hemianæsthesia. He made himself understood by gestures.

The next morning he complained of pain in the left frontal region.

His general health was restored in six weeks, and there remained only slight paresis of motility and sensibility on the right side, and the aphasic state.

At first he had complete aphasia and agraphia. Little by little he began to talk and extend his vocabulary, until, in the summer of 1879, he generally succeeded in expressing his ideas fairly well, and, in talking to laymen, it was sometimes not noticed that he was aphasic at all. He did not substitute the wrong words much. At first he could not read, but he reacquired the power partially only; there were always some long words in every sentence that he could only understand from the context. After several months he could copy, and even write short sentences of his own composition, but with great difficulty. Writing from dictation was impossible. In talking or writing he had a great tendency to substitute numerals for other words.

He understood gestures, and was always capable of expressing his ideas by them.

He had partial word-deafness from the start. He said: "The words I can't pronounce are the words I can't *hear*." Not all, but only some words were unintelligible to him. Sermons or lectures were to him a meaningless jargon.

Sight and hearing were unimpaired. He had no hemiopia. His appreciation of music was well preserved, as also were his memory and ordinary intelligence.

He showed a tendency to reverse the position of things he held, unless he looked at them. This was evidently due to an impairment of muscular sense. There was no common anæsthesia.

In March, 1880, he had another attack. While at dinner he suddenly turned to the right and began muttering inco-

* "A Contribution to the Study of Asphasia, with special reference to 'Word-deafness' and 'Word-blindness.'" By A. B. Ball, M.D. "Archives of Medicine," v., 1881, p. 136.

herently. The attack, he said, began with a noise in the head like a pistol-shot. Immediately he heard some one talking over his right shoulder, and turned to see who was addressing him.

In May, he was seized with symptoms pointing to endocarditis—perhaps myocarditis—and was much prostrated, and complained of mental confusion. On one occasion he had a marked rotatory phenomenon—rolling over and over to the right rapidly. On June 19th, he suddenly became totally blind, but gradually regained his vision in two hours, and died suddenly half an hour later.

On autopsy, it was found that the internal carotids were extremely thick and quite rigid, but not calcareous.

An area of softening in the left hemisphere covered the inferior parietal lobule and the posterior part of the first temporal convolution—parts supplied by the terminal branches of the left Sylvian artery. (See Fig. 4.)

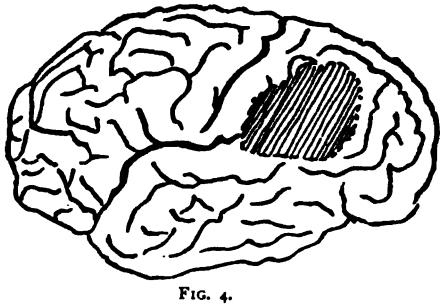

FIG. 4.

CASE V.*—Waiter, aged forty-four. He had been an excessive drinker of wine and beer for a long time. His health had commenced to fail three months before admission. He became short-breathed, and his ankles swelled toward evening. Afterward œdema invaded his lower extremities, genitals, and abdomen. In short, all the signs of general venous stagnation and slow and progressive asystole.

The liver was large and sensitive to pressure. The urine was scanty, dark, and albuminous. The respiration was short and rapid, and large subcrepitant râles were heard in the lower lobes of both lungs. The face was cyanosed, and a false venous pulse was present in the jugular veins.

No valvular lesion of the heart could be detected, but the

* "Note sur un cas de cécité et surdité cérébrales (cécité et surdité psychiques)," etc., A. Chauffard. "Revue de médecine," 1881, p. 939.

beat was soft, irregular, unequal, and diffused. The patient was kept quiet, and put on milk diet, infusion of digitalis, and drastic purges. For three months the symptoms gradually improved without entirely disappearing. Six or eight litres of ascitic serum were withdrawn by several punctures.

One evening, without warning and without loss of consciousness, the patient suddenly lost the power of speech and the use of his intellectual faculties. The next morning he was found sitting up, immovable, his elbows on the bolster, his eye fixed on vacancy, apparently lost in thought. He saw nothing, heard nothing, and appeared to have no consciousness of what surrounded him.

If spoken to loudly and repeatedly, he turned toward the side from which the sound came, but appeared to understand nothing that was said to him. The pupils were moderately dilated and immovable. The eye was vacant, and did not follow objects which crossed his visual field, but was not amaurotic, because he took his glass or napkin and other things which he needed. There was a partial ptosis on the right side. The patient's motor power was unimpaired. If the skin was pricked, the part was slowly withdrawn, but no signs of pain were manifested.

The respiration was calm, deep, and regular; the heart's beat was soft and arhythmical, and there was a doubtful soft murmur at the apex. The urine was still albuminous.

The treatment consisted of alcohol.

The next two days the patient remained in the same condition, oblivious of surroundings and unmindful of peripheral excitations. He remained silent, or mumbled incoherently, or repeated, mechanically and with the same monotonous tone, "I am better, I am better." The fundus of the eye was normal.

On the third day the cerebral torpidity was more marked, and the patient remained somnolent and half-comatose. Being bled 300 grammes gave no relief.

In the evening, after two or three slight convulsive attacks, death supervened. During the illness of three days the temperature oscillated between 37° and 37·5° C.

On autopsy, the heart was found to be enormous and overloaded with subpericardial fat. The cavities were dilated and filled with clots. The wall of the left ventricle was 1·5 cm. thick, but flabby and soft. The orifices and valves presented no lesion, only the tricuspid valve appeared enlarged by a simple distension of the fibrous ring upon which it was inserted.

The arch of the aorta was cylindrical and slightly dilated. Its walls were thickened, and the intima was the seat of cracked, calcareous patches, also yellow and fresh and friable gelatinous patches. On the upper wall was a loss of substance covered by a blood-clot. There was a small, yellowish patch at the origin of the left Sylvian artery.

In the cortex of the left hemisphere was a patch of red softening in the parietal lobe. (See Fig. 5.) It was bounded above by the interparietal fissure, while below it overlapped the upper extremity of the parallel fissure and parts of the first and second temporal convolutions. The patch was nearly round, and about three centimetres in diameter. It involved the entire thickness of the gray matter, and invaded slightly the subjacent white matter. Embolism, if it existed, could not be demonstrated.

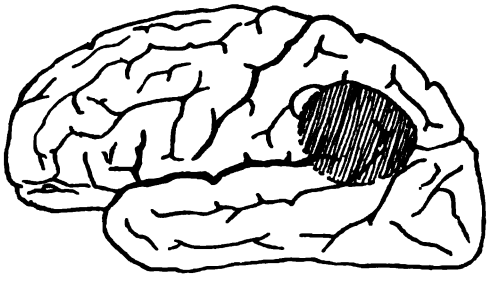

FIG. 5.

There was a large nutmeg liver, with indications of perihepatitis and perisplenitis, congested lungs, and congested and fatty kidneys.

CASE VI.*—The patient was a widow of forty-six. She had never menstruated. For three months she had had continual bilateral headache, so much worse at night that sleep was impossible. She had not vomited, lost consciousness, nor had epileptic attacks.

On admission, February 22, 1882, her state was as follows: She had violent headaches; there was slight dilatation of the right pupil. When asked her name, she would turn her head, but say nothing. On repeating the demand, she replied, first, "What do you say to me?" secondly, "I don't understand," and the third time she replied correctly and

* "Note sur un cas de surdité cérébrale." C. Girandeau, "Revue de médecine," ii., 1882, p. 446.

gave her name. Sometimes, by repeating questions in this way two or three times, she would answer correctly. Often it was impossible to make her understand at all, and to all questions she invariably replied, "What do you say to me? I don't understand you! Cure me!"

Hearing and sight were intact. She read well, and answered questions which were written and shown to her. Common and special sensibility were intact. Motility and the reflexes were normal.

February 28th.—To all questions she answered, "Cure me!" The headache was apparently intense.

March 2d.—Whenever addressed she held up her head and said, "I do not understand." She died comatose at 2 P. M.

On autopsy, there was found a tumor the size of a walnut in the posterior part of the left temporal lobe. Above, it reached the fissure of Sylvius; below, it involved three

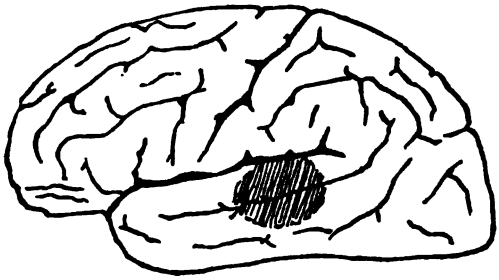

FIG. 6.

quarters of the breadth of the second temporal convolution. It reached forward to within three centimetres of the anterior extremity of the temporal lobe, backward to within one centimetre of the posterior extremity of the fissure of Sylvius. It encroached slightly on the white matter, and was easily enucleated. (See Fig. 6.)

The tumor, on microscopic examination, proved to be a sarcoma.

CASE VII.*—A widow, aged fifty-one, entered the hospital in a state of maniacal excitement.

She pronounced many words imperfectly, so that her

* La Sordità Verbale od Afasia Sensoriale. Studio Clinico ed Anatomico-patologico del Dott. Giuseppe Seppilli. "Rivista Sperimentale di Freniatria e di Medicina Legale," 1884, anno x, fascic. i–ii., p. 94.

speech was rather difficult to understand, while her flow of ideas seemed active enough.

When she became quiet and her attention was attracted, she did not appear very attentive, and manifested surprise if spoken to, as if confused, or as if imperfectly understanding what was said. When asked to protrude the tongue, give her hand, or raise the arm, she did not execute the movement, but would sometimes reply, "Call me Assunta."

If, without speaking, she was told, by a gesture, to make some movement, she obeyed with singular promptness.

Her mode of expression was notably altered; she articulated words well, but they were often unintelligible because of the omission of syllables or other changes. Being shown an object, the patient might call it by an absurd name; but, on being told the right one, perceived her error and pronounced the correct name over and over.

If shown an object of which she had the correct idea, but not the name, as a pin, she would appear to think a long time, and then, apparently tired out with the endeavor, she would say, "Prick, prick." She expressed some ideas spontaneously with perfect accuracy.

She perceived the slightest noises, and audition seemed perfect in both ears.

The acuteness of vision was unimpaired in both eyes. The left pupil was always smaller than the right. There was no lesion of the fundus oculi. Her mental faculties, after the subsidence of the delirium, seemed unimpaired. Sensibility and motility appeared normal. One day, while in the hospital, the patient had an apoplectiform attack. She was semi-comatose and speechless, and had paresis of sensation and motion on the left side of the body with exaggerated tendon reflexes. She recovered from this, but eight days later was seized with a right parotitis, with a temperature of 39·4° C. The paralysis came on in an aggravated form and confined the patient to bed, where she acquired bed-sores and soon died of pyæmia.

At the autopsy there was found an opacity, with thickening, all along the left Sylvian fissure. The membranes were tenaciously adherent in spots along the first and second frontal convolutions and on the orbital convolutions of both sides, and over the first and part of the second convolution of the left temporal lobe. This meningeal adhesion extended back a little on to the external part of the supramarginal gyrus. (See Fig. 7.) There was a very slight adhesion at the extreme tip of the right temporal lobe. The foot of the left third frontal convolution was intact.

Spots of cortical softening corresponded to these patches of adhesion, especially marked in the first and second left temporal convolutions.

CASE VIII.*—A male, aged fifty-six. A year previously suffered with an intense headache, accompanied by some mental disturbance. As a child, he had epilepsy. He abused alcohol.

On admission, he had an air of hebetude, and seemed entirely oblivious of what was going on around him. To all questions he replied, "That there; yes, that." He talked little and in a confused manner, and also his articulation seemed changed. He showed indubitable signs of dementia; external impressions provoked no ideas, no sentiments, and his language was reduced to a very few phrases. His sense of hearing seemed acute. Commands accompanied by explanatory gestures he obeyed.

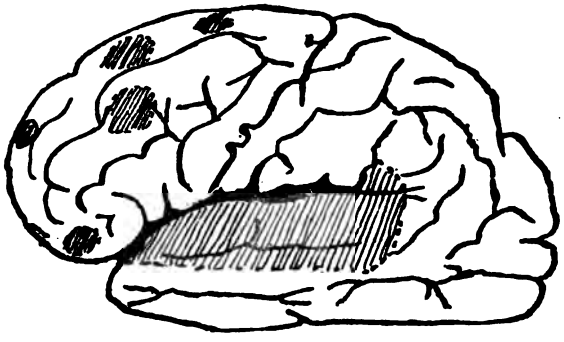

FIG. 7.

Voluntary activity was lessened, and he made all movements very slowly. He walked alone, but lifted his feet very little. His muscular force was well preserved. General sensibility and vision seemed well preserved. An ophthalmoscopic examination revealed no lesion. Some circulatory disturbances pointed toward atheroma of the aorta with hypertrophy of the left ventricle.

One month after admission, the patient died immediately after an epileptic attack, with contracture and turning of the head to the left.

At the autopsy there was found an area of softening occupying the entire second temporal convolution, the external half of the first and the internal half of the third

* Seppilli, *l. c.*

temporal convolution, on the left side. (See Fig. 8.) The cortex in this region was completely destroyed. The basal ganglia were intact.

CASE IX.*—A man, aged seventy, made known his wants by ordinary language, but did not understand a single word spoken to him. He was in a condition of senile mental weakness. His hearing was good. He had visual disturbances, which suggested psychical deafness.

In the right hemisphere there was found an old cyst from softening in the place of the sulcus hippocampi, with complete destruction of the cuneus of the first and second occipital convolutions.

On the left side there was a small recent softening of the second and third occipital and second parietal convolutions. Along the first temporal convolution was a cyst full of a serous liquid.

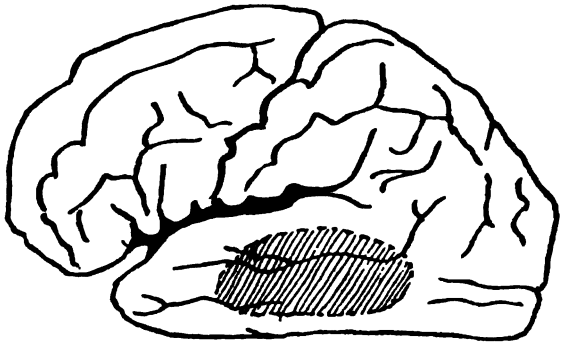

FIG. 8.

CASE X.†—In a male, aged thirty-seven, speech was reduced to a few words. Understood nothing said to him. Comprehended gestures. Hearing was intact. He had left hemiplegia with contracture.

There was a cortical encephalitis of the right ascending parietal convolution. A second area of softening involved the first and the front part of the second temporal convolution of the left side.

CASE XI.‡—A woman, aged fifty-five, with motor aphasia.

* Monakow, "Arch. f. Psych. u. Nervenkr.," Bd. xiv., Hft. 3, 1883, quoted by Seppilli.

† Rosenthal, Erlenmeyer's "Centralblatt," No. 1, 1884, quoted by Seppilli.

‡ Magnan, "Gaz. des hôp.," No. 59, 1883, cited by Seppilli.

Could read writing or print, but did not understand spoken words. Read the papers with pleasure. Made her wants known by writing. There was found a diffuse sclerosis of the left third frontal convolution and insula, while a spot of softening occupied the first and second temporal convolutions.

CASE XII.*—A woman, aged forty-three, whose language consisted of inarticulate sounds. Understood nothing. Would take nothing that was given to her, and appeared deaf and stupid.

She was seized with epileptiform convulsions, followed by transitory right hemiplegia. A little later there was slight paresis of the left arm.

A gummy infiltration occupied the entire first and second temporal convolutions on the left side and the white substance underneath. The dura and pia mater and cortex were all massed together.

The right temporal lobe was equally involved except upon the upper and posterior part, the lesion extending over upon the inferior parietal lobule and the angular gyrus.

CASE XIII.†—In this case speech was completely abolished. Did not understand what was asked of him except by gestures. The writing was reversed, and with the left hand. There was slight deafness. There was paralysis of the right extremities.

On autopsy, there was found embolism of the left Sylvian artery, with softening of the insular and the posterior part of the first temporal convolution and inferior parietal lobule. There was also cellular infiltration of the basal ganglia.

CASE XIV‡.—A man, aged thirty, had motor aphasia and word-deafness. He understood words very imperfectly, some not at all. If spoken to in a loud voice, he did not reply. He had paralysis of sensation and motion of the right side of the face, paresis and anæsthesia of the right arm. His hearing was intact.

On autopsy, there was found a rupture of a small aneurism situated on a small lateral branch of the external frontal artery, causing an effusion which covered the convolu-

* Wernicke and Friedländer, "Fortschritte d. Med.," No. 6, 1883, quoted by Seppilli.

† Weiss, "Wiener med. Woch.," No. 12, 1882, quoted by Seppilli.

‡ Petrina, "Sensibilitätstörungen bei Hirnrindläsionen," Prague, 1881, quoted by Seppilli.

tions of the insula, and the interior and upper part of the first temporal convolution. The outer part of the cortex underlying this clot was softened and of a yellow color.

CASE XV.*—A woman, aged seventy-five, answered all questions incorrectly. Her spontaneous vocabulary was very good. She often corrected wrong words. She pronounced some things thickly. Her intelligence was weakened and confused. Her sensibility and motility were apparently intact.

The cerebral convolutions were atrophied. She had diffuse atheroma of the cerebral arteries, thrombosis of the Sylvian artery, and softening of the entire left first temporal convolution and a part of the inferior parietal lobule. The insula was intact.

CASE XVI.†—A man, aged forty-nine, whose speech consisted of queer, inarticulate sounds, except an occasional "If you please," or "Thank you." Often entered into long conversations with persons near him, evidently thinking he expressed himself well, and not conscious that he talked unintelligibly. When talked to, evidently understood nothing, and could not read writing or print.

He had right facial paresis and right hemianæsthesia. There existed softening of the supra-marginal gyrus, the angular gyrus, the first and second temporal convolutions, and a part of the neighboring occipital lobe of the left hemisphere.

CASE XVII.‡—A man, aged sixty-eight, understood nothing said to him. He answered always wrongly, while he spoke correctly. His intellect was weakened. His hearing was good. There was found a softening involving the left first temporal convolution, except its anterior third. This disorganized cortex, and also the corresponding border of second temporal convolution, had a brown color.

CASE XVIII.§—A man of fifty had motor aphasia and word-deafness. There was right hemiplegia, with hemianæsthesia to touch, pain, and heat. His hearing was good. There was softening of the lower third of the first frontal

* Wernicke, "Der aphasische Symptomencomplex," Breslau, 1874, cited by Seppilli.

† Broadbent, "Lancet," 1878, cited by Seppilli.

‡ Claus, "Der Irrenfreund," No. 6, 1883, quoted by Seppilli.

§ Petrina, *l. c.*, quoted by Seppilli.

convolution and the upper and anterior part of the first temporal convolution of the left side.

CASE XIX.*—A woman of forty-two, whose speech was unintelligible. Understood absolutely nothing. Her sensibility and motility were both good. The convolutions of the left temporal lobe were jelly-like; also the right temporal lobe was slightly softened. A section showed that the softening was confined to the cortex, on the right side of all the temporal convolutions except the basilar, and on the left side to the same region. The foot of the third frontal convolution was not included.

CASE XX.†—A man of fifty-eight. Pronounced only the word "dijon." Did not understand the most simple demand. Did understand gestures. His intelligence was weakened. There was slight weakness of the lower part of the face and the extremities on the right side. There was softening of the first and the upper part of the second temporal convolutions, extending back on to the parietal and occipital lobe, and forward on to the base of the first frontal convolution. A section showed a focal lesion in the substance of the third frontal convolution.

CASE XXI.‡—A female was suddenly seized with amnesic aphasia. There was no affection of sensation or motion; smell and taste were normal. She kept both eyes turned to the left. The ophthalmoscopic examination was negative. There was embolism of the parieto-sphenoid branch of the left Sylvian artery. The entire left lower parietal lobule was the seat of a softening which extended somewhat upon the second occipital convolution.

CASE XXII.§—A male, aged sixty-four, had right hemianopsia, agraphia, aphasia, and ataxia.

On autopsy, there was found an area of softening in the left occipital lobe, and the posterior parts of the second temporal and inferior parietal convolutions. This softening extended in toward the lateral ventricle. A second area of softening, in the left external capsule, encroached on the

* Kahler and Pick, Vierteljahresschrift f. d. prakt. Heilkunde, Nos. 1 and 3, 1879, quoted by Seppilli.

† Kahler and Pick, *l. c.*, cited by Seppilli.

‡ Fritsch, Wernicke, cited by Starr.

§ The Visual Area in the Brain determined by a Study of Hemianopsia, by M. Allen Starr. Am. Jour. of the Med. Sci., January, 1884, p. 65.

lenticular nucleus and the anterior part of the internal capsule.

CASE XXIII.*—A woman, aged thirty-seven, had been in the Charité, in the service of Hardy, for six weeks for a slight right hemiplegia, with aphasia. She could pronounce a certain number of words easily, but expression of ideas by speech was much impaired. At first she had indisputable word-blindness. She read, but did not understand. She wrote correctly at dictation, and read it, but did not understand it at all. During the next fifteen days she gradually became completely aphasic, and had a very pronounced right hemiplegia. Both these symptoms were variable.

On autopsy, there was found a gliomatous tumor, the size of a mandarin orange, in the inferior parietal lobule.

CASE XXIV.†—An adult male was suddenly attacked with inability to be understood; wrong words were substituted. There was no paralysis. He had a pressure feeling and slight pain on left side of head. He was depressed. There were hallucinations of vision. He could not write from dictation at first.

Three months later he cut his throat.

The arteries at the base were atheromatous in patches. There were miliary aneurisms, and several small cavities containing serum scattered throughout the occipital lobes. In the left hemisphere, just above the lateral ventricle, there was a yellow spot twelve mm. in diameter. At the extreme posterior end of the fissure of Sylvius, just above its superior margin in the supra-marginal convolution, there was a cavity two cm. in diameter. In the outer member of the right lenticular nucleus, adjoining the external capsule, was a pear-shaped cavity, five by twelve mm. in diameter.

To supplement the pathological facts in the preceding pages, there is really very little to add.

The profound study to which aphasia has been subjected has led observers to make a sharp clinical and anatomical distinction between motor and sensory aphasia.

Sensory aphasia, clinically, may be:

1. Word-blindness: where the patient can talk or write

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* Déjérine, Soc. de biol., July 17, 1880. Prog. méd., 1880, viii., 629.

† Webber, S. G., Boston Med. and Surg. Jour., December 20, 1883, vol. cix, p. 580.

spontaneously, but where, with or without mental or visual disturbances, there is an inability on the part of the patient to understand written or printed speech, even though he may read it aloud correctly. In short, a state in which all visual impressions connected with language, except gestures, fail to be transformed into visual verbal images.

2. Word-deafness: where the patient can talk or write spontaneously, but where, with or without mental or auditory disturbances, there is an inability on the part of the patient to understand articulate speech. In short, a state in which all auditory impressions connected with language fail to be transformed into acoustic verbal images.

3. A combination of both word-blindness and word-deafness.

Sensory aphasia is at times associated with amnesic and motor aphasia, right hemiplegia, mental disturbances, and hemiopic defects of vision.

Before the subdivision of sensory aphasia was made, it was often noticed that aphasic symptoms did not invariably point to a lesion of the left third frontal convolution and insula, Broca's centre for articulate speech. But in these cases this region was often entirely intact, and the lesion was found behind and below the motor area of the left hemisphere.

In the light of our present knowledge, we designate these cases of sensory aphasia either word-deafness, word-blindness, or both, entirely distinct from motor aphasia, the lesion of which Broca so accurately located.

Thus the lesion of sensory aphasia in the case of word-blindness is apt to be included in the region about the posterior extremity of the fissure of Sylvius, the inferior parietal lobule, the angular gyrus, and the second occipital convolution of the left side, or parts subjacent to them.

In the case of word-deafness the lesion is apt to include the first and second temporal convolutions of the left side, or parts subjacent to them.

The first of these areas, physiologists have long taught us, is in animals intimately connected with vision; the sec-

ond, with audition; hence we have learned to call them the visual and auditory areas of the brain, respectively.

Of the twenty-four patients whose cases form the basis of this paper, eight, with lesion of both visual and auditory regions of the left hemisphere, had "word-blindness" and "word-deafness;" two, with lesion of the visual area, had "word-blindness;" and fourteen, with lesion of the auditory area, had "word-deafness."

THE ASIATIC CHOLERA, AS IT APPEARED AT SUSPENSION BRIDGE, NIAGARA COUNTY, N. Y., IN JULY, 1854, AND ITS LESSONS; WHAT WE KNOW OF THE CHOLERA.*

By FRANK H. HAMILTON, M.D.

It seems to me opportune, when the presence of the Asiatic cholera in Europe renders it possible if not probable that it will before long again visit our Continent, to fulfill a promise made thirty years ago to Dr. Sanford B. Hunt, then editor of the Buffalo Medical Journal, that I would prepare a paper on the cholera as it appeared at Suspension Bridge in the summer of 1854;† and to supplement this with a brief summary of our present knowledge upon this subject.

From 1849 to 1854 there had been several severe epidemics of cholera at Buffalo, but they had never extended in any noticeable degree to the neighboring towns until the year 1854. On the eighteenth day of July of this year the first case occurred at Suspension Bridge, a small village twenty-two miles from Buffalo, and about two miles below Niagara Falls. In a few days it had spread through the village, and especially among the laborers employed by Mr. Roebling in the construction of the bridge, which was then near its completion.

Of the virulence and fatality of this epidemic, Dr. Hunt, who had made three visits to the village, and, therefore,

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* Read before the New York Academy of Medicine, November 6, 1884.

† Buffalo Med. Jour., vol. x., p. 181.

testified as an eye-witness, wrote as follows in the Buffalo Medical Journal:

"It is also our duty to record a most fatal visitation of cholera at Suspension Bridge, near Niagara Falls. Probably no locality in this country has ever suffered so severely, unless we except Sandusky. But it is doubtful whether even that epidemic, terrible as it was, equaled in fatality, and in the mournful and shocking character of its incidents, the one at Suspension Bridge."

Dr. Hunt then proceeds to give a brief account of his own personal experience. "Many survived," he says, "but six hours after the attack, while in some instances there was no premonitory diarrhœa." . . . "The panic was indescribable. Patients went into collapse immediately after their attack, while some perished from congestion." . . . "Treatment, in the majority of cases, availed but little. Nurses could not be procured on the Canada side, and in our rounds on that shore we frequently found men left alone, with a bucket of water by their side, to die uncared for." . . . "Four dead bodies were, in one instance, disposed of 'by burning the shanty in which they lay.'"

Dr. R. J. Rogers was at that time the only physician practicing in that village; and he remained on duty from the beginning to the close of the epidemic, giving himself little or no rest day or night, until compelled to do so in consequence of his own illness. In reply to a letter recently addressed to him, he writes as follows:

"MY DEAR DOCTOR: I take the first leisure to reply to your letter asking information in reference to the remarkable cholera epidemic which prevailed at this place in July, 1854. The minutes and records I made at the time have been destroyed or lost; but the events of those few days were so stamped upon my memory that a quarter of a century has failed to efface them.

"The visitation was remarkable for the suddenness of its appearance, its short duration, the number of cases, and its terrible fatality.

"About the 15th of July a company of German emigrants were *dumped* upon the banks of the river from the cars,

awaiting transportation across the then unfinished bridge. Two or three cases of what was called cholera morbus were reported to me, and, on visiting them, I found unmistakable symptoms of Asiatic cholera. One of them died in a few hours and was left for burial, while the rest of the sick were sent West with their party that evening. On the second night from this—the 20th—a sick traveler or tramp applied at the Bellevue House, kept by Mr. Sock, and, as you will remember, situated under the hill near the bridge, and was refused admission. He sought shelter under a shed in the rear of the house, where he was found dead in the morning. This was the second case recognized as cholera. That same day a ship-carpenter, working on the steamer New Maid-of-the-Mist, was attacked and died in about thirty hours. The vessel was then being constructed at the landing on the river, just below the Bellevue House. On the same day, also, three laborers, boarding at the Bellevue House, died of cholera; and on the 21st or 22d the mother of the hotel keeper died after a few hours' illness. Almost simultaneously with this case and directly opposite, in a shanty on the Canada side of the river, the wife of an Irish laborer was taken sick and died that afternoon. They had a wake that afternoon over the corpse (which means whisky), and, of those engaged in the wake, five died of cholera within twenty-four hours.

"I mention these as the preliminary cases only, for after this the cases multiplied rapidly. On the night of the 24th four strong, healthy men, two of them foremen or overseers, were attacked, of whom three died within twenty-four hours. This was the most fatal night and day, and the cases had become so numerous that it was impossible for me to see them all, much less to give them the needed attendance. By this time also the people had become panic-stricken, and as many as were able fled with their families, thus leaving fewer victims for the disease to feed upon.

"It was almost impossible to get at the number attacked, but it has been ascertained that there were at least eighty deaths on the two sides of the river; and, when we consider the proportion which this number bears to the actual population at that time, this result is appalling. When the disease broke out there were not more than eight hundred on the American side and perhaps five hundred on the Canada side, of which entire number probably five hundred left almost immediately. We have, therefore, to record the terrible fact that the actual population was decimated by the disease in about ten days.

"Much was said and written at the time by medical men as to the probable cause of the virulence of the epidemic; but, in order to a full understanding of this matter, it will be necessary to state that more than nine tenths of the victims resided on the narrow flats bordering the banks of the river on both sides. Of these, fully one half were employed in the construction of the bridge—wiremen, blacksmiths, and carpenters. Three of the four gatemen died.

"During the whole prevalence of the disease the weather was excessively hot. There had been frequent rains, and the water stood in pools around the shanties, that were huddled pretty close together on the low ground. These, having been hastily constructed, with perhaps one door and one window, were deficient in light and ventilation. All who occupied this low ground, on both sides of the river, used exclusively the water obtained from a sulphur spring situated near the bridge on the American side. This water was clear and cold, and flowed in a copious stream—probably several gallons a minute. Apparently it contained nothing prejudicial to health, but it was strongly impregnated with sulphur.

"The strip of flat land which we have described is, on the American side, from forty to fifty rods wide. The soil, which is so thin that the rocks come to the surface in many places, is clay, covered with a slight layer of muck or alluvium. Across this a large open sewer had been dug to the bank of the river, but this was not yet in use. From the low ground there arose abruptly, to the height of about twelve feet, and extending parallel with the river, a bank, composed of red clay and terminating above in a plateau or level plain, which extended back into the country several miles, through which there had been made recently numerous excavations for railroads and buildings.

"After the disease began to subside, on examination, under the Bellevue House a large amount of filth was found to have accumulated, and also stagnant water. There was no cellar. Two men, brought from Lockport, were employed to clean the premises and remove the filth, and both of them died in a day or two of cholera. I do not remember that any other premises in that locality were found so bad.

"In localizing the disease more precisely, I will state that it was confined mostly to a very small area, not averaging more than a hundred rods in width, and perhaps twice this distance in length, on both sides of the river. There were

a few cases among those who had fled from the disease a mile or two back in the country; notably among the latter was the proprietor of the Bellevue House, whom, you will remember, you were called to see, and who died that night.

"One remarkable feature of the epidemic was that, in a majority of the later cases, there was an absence of the usual premonitory symptoms, many of the patients being in collapse within an hour. In the earlier cases, however, there was the usual vomiting, and then rice-water discharges, accompanied with no pain usually, but with great lassitude and dejection, followed by cramps, confined mostly to the muscles and tendons of the toes, a gradual lowering of the temperature, profuse sweating and great thirst, the skin assuming a leaden color and losing its contractility, the pulse deserting the wrist, the tongue becoming cold, and the voice husky. As the period of unconsciousness approached, there would be restlessness, and, long after the cessation of the pulse, there would be considerable muscular activity. During the two or three most fatal days I would find the patients within a few hours of the attack with a cold tongue and pulseless, and with such a degree of hoarseness that they could only speak in a whisper, and still they could get up and walk about the room. Some had no vomiting or purging, and lived but a few hours.

"Of all the fatal cases, but five occurred in that portion of the village which was situated above the lower plain just described. The last died on the 30th, and this person was the wife of the writer.

"I have now, my dear doctor, given you all that is within my recollection, and perhaps all that is pertinent to your inquiries. I ought to add, however, that I think we estimated at the time that at least 70 per cent. of the cases proved fatal.

"As to the treatment, I will only state that the efforts to restore warmth to the surface by irritation, or by hot applications, or by stimulating drinks administered internally, were never attended with any satisfactory results; nor would they restore but temporarily the flagging circulation or the sinking pulse. Swathing the patients in wet sheets was thought at first to be beneficial, for it removed the dark leaden color of the skin almost immediately and restored the natural color, the absorption of the water compensating, in a measure, for the loss of the serum of the blood; but in the end it all seemed 'vanity of vanities.' Homœopathy and hydropathy were alike tried by one or

another of the sufferers, and they alike failed. The latter form of treatment was tried most thoroughly by Mr. John A. Roebling, the distinguished engineer. He was a great admirer and personal friend of Priessnitz, and, fully believing in his theory, on the morning of that very fatal day he improvised a hospital and had eight patients subjected to that form of treatment, but they *all* died before night.

"If you can glean sufficient from this long letter to give interest to your article I shall feel compensated, for I have always felt grateful for the valuable assistance you rendered me on that trying occasion, as well as to your two distinguished associates in the medical profession, Dr. Sanford B. Hunt and Dr. Thomas F. Rochester. The former was with me three days, and made a short but interesting report of the epidemic in the Buffalo Medical Journal, of which he was then the editor.

"I am very respectfully yours,
"R. J. ROGERS."

The foregoing narration of the circumstances and events connected with this epidemic, not originally intended for publication, but now published by the writer's consent, is so complete and graphic, and furnishes such an exact portraiture of what came under my own observation, that I am relieved of the necessity of doing more than to give it my indorsement, and of adding a few facts communicated to me by Dr. Rogers in subsequent letters, together with a few more drawn from my own personal experience and recollection.

Dr. Hunt, Dr. Rochester, and myself visited Suspension Bridge in response to a request made by Dr. Rogers to the physicians of Buffalo that they would come to his relief, as he had become completely exhausted, and was unable any longer to answer the unceasing demands which were made for medical services. Our visits were made alternately and on successive days, my visit being made, I think, on the 23d, and extending through a portion of the 24th, at which time the epidemic was about at its height of malignancy and of fatality.

Arriving at the house of Dr. Rogers in the afternoon, I left Mrs. Hamilton, who had chosen to accompany me, in

the care of Mrs. Rogers, of which estimable lady Dr. Rogers has spoken in his letter as being the last person in the village who, five or six days after my visit, succumbed to the disease. I then proceeded at once to answer two or three urgent calls in the upper village, which was composed of about thirty comfortable residences, and in one of which the patient had died a few minutes before my arrival.

Returning to Dr. Rogers' house, I found Colonel Fiske, subsequently made president of the village, waiting to go with me to the lower village, or "Shantytown," as I shall call it by way of distinction.

Together Colonel Fiske and myself visited almost every house which was occupied, in most of which were one or more sick, or dying, or dead. A number of families had fled hastily, leaving their effects unprotected in their houses. In one shanty lay a dead woman upon a bed, and she was the sole occupant of the house.

Remedies, so far as they seemed to be indicated, were administered from the small satchel supplied with medicines and restoratives which I carried with me; but the principal duty which seemed to devolve upon me, and in this I was seconded by Colonel Fiske, was to urge the people to get away. In many cases this seemed to be impossible. They were poor, and they would have to carry with them their aged parents and young children—their sick and dying and dead; and they must leave the little property they had behind them. If conveyances could be procured, who would take the risks of removing them? Who would receive them into their neighborhood with their load of pestilence? Although I thought then, and do now, that the danger of communicating the disease to other persons in places where the sanitary conditions were more favorable was very small; but those living in the neighborhood of the infected district no doubt thought differently.

That night I was called to Plitcher's Corners, three miles into the country, to see Mr. Sock, the keeper of the Bellevue House, Shantytown, who had fled the day before, but not until his wife had died. In him also the seeds had been

planted before he left the Bellevue House, and I found him in collapse. He died in a few hours. Dr. Rogers has been unable to learn whether any members of the family in which Mr. Sock died, or any of the neighbors living in the same village, were affected with the disease or not, but it may be assumed that they were not, inasmuch as Dr. Rogers would certainly have been called to attend them in case they had been.

On returning from my visit to Mr. Sock, although the day had not begun to break, I found new messages from Shantytown. By the aid of a lantern I again visited many of the houses. Several new cases had occurred; some that I had seen before were dead, and a few of the older cases were slightly better. The air was more close and stifling than it had been during the day. Outside one of the shanties near the bridge—it was now broad daylight—lay a man suffering from cholera who had been refused admission by the woman who occupied the shanty, and I was unable to change her decision. Walking thence across the bridge—and this was the first time I had been able to answer the calls from the Canada side—and going from shanty to shanty, I found the condition of the occupants much the same as I had found them upon the American side. In two of the shanties wakes were in progress.

Returning to the house of Dr. Rogers, and continuing to attend to the calls of such as asked for medical aid until after mid-day, I then left for Buffalo.

I will mention, as additional facts worthy of note, that there had been a protracted drought, followed within a few days preceding the epidemic by copious rains, and that, consequently, as mentioned by Dr. Rogers, the water stood in pools here and there on the low grounds. An open drain had been recently constructed from the Monteagle across the low ground at the north end of the collection of shanties on the American side. From this a good deal of fresh earth had been thrown up, and still lay exposed.

The Monteagle was then being constructed about one hundred rods north of the bridge, and on the highest ground

of the neighborhood. Only one person fell sick of cholera who was employed upon this work. There were no shanties near the sulphur spring, and none so situated as that their refuse water or the human excreta could drain into it. This spring was considered so valuable by Mr. Roebling that he subsequently had constructed for it a granite basin, inclosing it with a railing, and it can now be seen just north of the bridge abutment on the American side. Its source is from underneath the abutment. Its flow is less abundant than formerly, and it is less strongly impregnated with sulphur.

On the Canada side, also, extensive excavations had been made, and the ground upon which the shanties were built was much lower than the adjacent ground.

During the progress of the epidemic two or three cases of cholera occurred at Lewiston, a few miles below, and about the same number at Niagara Falls, two miles above. In the latter place it occurred among the laborers employed in excavating a hydraulic canal. It is most probable that the germ was conveyed to both of these places by fugitives from Suspension Bridge, but the disease found no soil proper for its germination, and it died out.

The Bellevue House stood upon piles, two or three feet high, having no cellar, and a good deal of filth had accumulated underneath. In the neighborhood of the shanties there was some degree of uncleanliness, but no more than is usual in such settlements. Many of the shanties, being quite near the precipitous bank of the river, had a natural drainage, which was much to their advantage. In my visits I did not notice any unpleasant odors.

As early as practicable after the commencement of the epidemic disinfectants were procured, and employed freely in and about the dwellings.

There are certain inferences which may be made from this experience, and there are certain lessons taught by it which ought not to be forgotten. It is not pretended that these lessons are new, but only that they have been presented in this instance in such an impressive manner as to entitle them to special notice.

Before attempting to point out and enforce these lessons, I will state briefly what, in my opinion, is the present state of our knowledge upon the main points relating to the nature, ætiology, mode of propagation, and treatment of Asiatic cholera.

WHAT WE KNOW ABOUT CHOLERA.

1. We have no positive knowledge of the existence of a specific cholera-germ.

While the existence of a specific cholera-germ, endowed with the principle of life and capable of growth and propagation when supplied with its proper nutriment, is rendered probable by many facts and analogies, yet such a supposition has not been established by strict scientific observation or reasoning.

I employ the term "cholera-germ," then, only as a substitute for "cholera-infecting material," whatever that may be, and as the term which most nearly expresses my belief as to its nature.

2. So long ago as 1854 or 1855, Professor Filippo Pacini, of Naples, published in the Italian Medical Gazette, a paper on cholera, in which he describes a germ or microbe, and to whose presence he ascribed the epidemic cholera. His paper was translated into French and English, and republished in 1865, 1866, 1871, and 1879.

Koch has more recently (1883) discovered in the intestinal secretions of cholera patients a bacillus or spirillum, designated usually as the "comma" bacillus or spirillum, which, so far as his observations have extended, is uniformly present in well-defined examples of cholera, and is not found in any other conditions of disease or of health.

Dr. H. Vandyke Carter, of Bombay,* has found an organism which it is conceded resembles very much the comma microbe of Koch. The presumption seems to be that it is the same, but of which microbe Dr. Carter says that it was

*Med. Record, September 27, 1884, p. 350. From the Lancet for September 6, 1884.

not uniformly found in cases of cholera, and that it was occasionally present in cases of diarrhœa and dysentery.

Dr. Maurin and Dr. Lange, as the result of their studies at Marseilles,* announce that they have discovered a mucor, which, in the process of its development, germinates spores, and these in turn germinate a new form of mucor, termed anaërobium; these latter, sporifying, give birth to the bacilli of Koch; and, finally, the bacilli develop the original mucor, and thus the cycle of life and development is completed. They regard the second form of mucor or anaërobium as the immediate cause of the phenomena of the disease, while they regard the bacilli of Koch as innocuous.

Dr. T. R. Lewis, of the British Army, assistant professor of pathology in the army school at Netley, has been studying the cholera also at Marseilles, and he reports as the result of his investigations, that the comma bacillus is present in all well-developed cases of Asiatic cholera, but that he has found it also in the salivary secretions of healthy persons.†

It is also stated as a fact, tending in some measure to corroborate the opinions of Koch, that two Swiss physicians, Ritsch and Nicati, experimenting at the Pharo Hospital, Marseilles, under instructions from the French Government, have caused the Asiatic cholera in rats, Guinea-pigs, and dogs, by injecting the dejections of cholera patients into the duodenum after tying the ductus choledochus, hoping in this way to prevent the action of the gastric secretions and the bile upon the bacilli.‡

Certainly, such statements ought to be received with a great deal of hesitation. So far as I am informed, none of these animals have been known to take the cholera under ordinary exposures, and the Egyptian Commission was unable to produce it by inoculation or injection in cats, dogs, mice, rabbits, or hens.

Dogs are the almost universal companions of men in all

*Med. Record, September 27, 1884, p. 350.

†Med. Record, October 4, 1884, p. 381; October 11th, p. 416.

‡Lancet, September 20, 1884, p. 504.

countries, both in health and sickness, and their habit of eating all kinds of decaying and filthy substances, including human excreta, is well known, yet I have never seen a case of cholera among dogs, nor do I know that any one else has. That these animals should have had some sort of disturbance of the bowels after the severe surgical operations to which they were subjected is quite probable, but that this was of the nature of Asiatic cholera is not, in the light of our experience with dogs, at all probable.

A correspondent of the New York Times, in a cable dispatch, says that Dr. Klein, a Bombay official and expert, has experimented upon himself by swallowing a quantity of the comma bacilli, and without harm.*

Professors Finkler and Prior, of Bonn, announce that they have discovered the comma bacillus in the stools of those suffering only with cholera nostras, or cholera morbus.†

Straus, Roux, Rocard and Thuillier, pursuing their investigations under the authority of the French Government in Egypt during the month of August, 1883, declare, for reasons which they assign, that they do not feel themselves justified in concluding that the comma bacillus of Koch is the cause of cholera.‡

Finally, MM. Sicard, Taxier, Loucel, Livon, and Chareyre, members of a commission appointed by the French Academy, and who pursued their investigations at Marseilles, report that the blood of a cholera patient injected into the veins of a rabbit will cause cholera; the perspiration thus injected does not transmit the cholera; the intestinal contents, loaded with bacilli, do not transmit the cholera when injected into the cellular tissue of the peritonæum, into the windpipe, into the blood, or into the intestines; that the comma bacillus is not the cause of cholera; and they conclude by saying: "We know better than our predecessors what the cholera is not, but we do not know what it is." §

* New York Times, October 5, 1884.

† Med. Record, October 18, 1884, p. 436.

‡ Archives de physiologie, 15 mai, 1884, p. 381.

§ Med. Record, October 25, 1884, p. 467.

We are at least permitted to say, in view of the conflicting testimony to which I have referred, and of many other statements made by less conspicuous observers, that the theory of Koch that the comma bacillus is the cause of cholera has not been established.

3. Even if it were established that the comma bacillus was always present in cholera and never present in any other condition of health or of disease, it would not determine the question whether this bacillus stood in the relation of cause or effect.

4. The theory is defective, also, in that it has not been shown that the ingestion or reception into the human system of excreta containing the comma bacillus will produce the cholera. On the contrary, if we can accept the current reports, there is at least the testimony of one experimenter that it will not.* The inoculations practiced by Koch himself were barren of results.

5. If the fact were demonstrated that the ingestion of choleraic discharges containing either of the microbes mentioned would cause cholera, the question would remain which of the microbes hitherto described was the efficient agent, or whether any of them were, or indeed whether it was not some microbe for the discovery of which the microscope has not yet been invented; and finally, whether it is a germ of any kind, or only the fluids in which they are contained, and which have undergone some peculiar changes, for the detection of which no microscope hereafter constructed may prove sufficient. By successful inoculation of the germs alone, after they have been completely isolated by cultivation, could they be proved to be the cause of cholera, and this has not been done.

I do not wish to underestimate the importance of microscopic studies; nor can I always accept of the estimate which some seem disposed to place upon them. They have added greatly to our knowledge of disease, and give us encouraging promise for the future; but, so far as cholera and

* The statement has been repeated more recently by the Medical Record, (November 8, 1884, p. 523.)

a majority, to say the least, of other epidemic and infectious diseases are concerned, they have not taught a single lesson either in the prevention or the cure. Their germicides kill the microbes when they are attacked outside of the body and removed from their native element, but they are harmless to them when the assault is made inside the human body; consequently, the unfortunate patients continue to die since the supposed discovery of the parasites the same as before.

It is not *positively* determined that the infecting material is not hereafter to be found in the blood or tissues of the body, in the breath, or in some other secretions than the intestinal. The experiments of the French Commission would at least seem to show that it is in the blood.

When, therefore, Koch places in contrast the results of microscopic investigations and the results of experience, declaring that the latter has not taught us the successful treatment of cholera, he permits the reader to draw an unfair inference. The contrast is not unfavorable to experience, inasmuch as it has taught us something, indeed, as will hereafter be shown, a great deal in reference to the treatment of cholera, while microscopical studies have taught us absolutely nothing.

6. The cholera-germ may be conveyed from place to place by clothing or any other textile fabrics, by articles of food, or by water, and by many other animate and inanimate substances.

7. It may be conveyed for considerable distances by the air. How far it can be thus conveyed it would be impossible to say, but probably much would depend upon the force of the wind and other atmospheric conditions. There is, no doubt, a limit to its conveyance by this method, and I have reasons to believe that it can not be thus conveyed beyond a mile or two.

Those who have denied, or permitted themselves to doubt, that cholera can be thus conveyed have, it seems to me, either been inexperienced, or they have closed their eyes to the testimony which the experience of almost every epidemic supplies in such abundance.

8. The theory of Koch that the germ only finds its way into the system through the mouth and stomach is the necessary corollary to his belief that the comma bacillus is found only in the alimentary canal, and that it is the true germ or cause of the disease, and the only medium of its propagation; but it can not be inferred from any facts observed by me in the histories of those epidemics in which I have had a personal experience, nor from anything I have seen recorded in my studies of this affection. That it may be one of the modes of propagation may be admitted, but that it is the sole or even the principal mode of propagation has no foundation other than Koch's unproved, and to me improbable, theory that the comma bacillus is the true germ of the cholera.

9. There is quite as much reason to believe that it is conveyed into the system by the respiratory organs, and that it diffuses itself throughout the entire body through the circulatory system, like any other septic infection, and that the specific symptoms and the specific choleraic intestinal secretions are the results of a general systemic infection. Why the poison expends its force in one direction or another, or why, perhaps, it seeks to eliminate itself through one organ of the body rather than another, can not be explained any more than we can explain the preference of eruptive contagious maladies for elimination by the skin, and the preference of other septic infections for other organs and tissues. It certainly is not necessary to assume, because the intestinal secretions are changed and the intestinal mucous membrane is congested, that the virus was implanted originally in the intestinal canal. The blood, the perspiratory and the renal secretions, and the kidneys themselves, undergo changes quite as marked and distinctive as those which take place in the intestinal secretions and in the mucous membrane of the intestines.

10. It is probable that the cholera germ or virus, although it may have been received into the system, does not necessarily infect the system, or give rise to cholera.

It seems probable that every person living in, or even en-

tering temporarily, a cholera atmosphere receives more or less of the virus into his system, but of those persons thus inoculated many do not suffer in any degree, and others only slightly, while a small proportion are taken sick and die.

It is true also of all other infectious diseases, that inoculation or the reception of the virus into the system does not necessarily produce the specific disease. Especially is this true of all eruptive infectious diseases. But in the case of most infectious diseases a large proportion of those exposed become infected, while in the case of cholera a very small proportion become infected. In other words, a suitable soil, or suitable conditions for the development of the germ, are usually found in the former, while in the latter they are seldom found.

We, of course, must except from this general statement, in regard to other infectious maladies than the cholera, variola in case the patient has been protected by vaccination. Cholera differs also from many other infectious maladies in that one attack affords no protection against a second.

11. The conditions requisite to render the inoculation of cholera by the ordinary methods effective are all those conditions which cause, or coexist with, disturbance of the natural secretions of the alimentary canal, including fear and other depressing mental emotions; the presence in the bowels of undigested, fermented, putrefying, or other acrid ingesta; deterioration of the air habitually inhaled, from personal filth, and from overcrowding in ill-ventilated apartments; inhalation of the air from putrefying masses of vegetable or animal matter, from stagnant pools of water, or from soils freshly exposed; and, finally, the concurrence of a warm and moist condition of the atmosphere.

Of all the conditions enumerated as favoring the germination of the cholera germ, none are probably so efficient as the inhalation of the vapors arising from a freshly exposed soil, especially if it contains decaying vegetable matter, and the concurrence of a humid state of the atmosphere with an elevated temperature.

The poor, both in cities and in the country, mostly occupy the lowest lands. If these lands are alluvial, and especially if underlaid with clay so as to retain the moisture, they favor the propagation of cholera as well as of other diseases. The preference which most epidemics show for the habitations of the poor is therefore often susceptible of another explanation than that their personal habits are uncleanly, or that they suffer from overcrowding and bad ventilation.

In addition to the testimony furnished by the Suspension Bridge epidemic, as to the relations existing between low and alluvial soils and the propagation of the cholera, I could add a personal experience in Buffalo and New York, but especially in the former city, through several epidemics. In Buffalo a low and *sandy* plain, bordering upon the lake and wholly occupied by Irish shanties, was almost entirely exempt.

In the report of Mr. Farr, Registrar-General of England, for 1848—'49, may be found a very full and complete statistical statement upon this subject; and after having taken into account, as contributory conditions, density of population, poverty, intemperance, uncleanliness, and many other causes, Mr. Farr concludes that the influence of a low and unwholesome soil was by far the most potent exciting cause. "It has been seen," he says, "how rapidly in London the cholera diminishes a few feet above the low ground on a level with the Thames."

This observation was not made for the first time by Mr Farr. It is as old almost as the existence of the cholera. Exceptions have been noted from time to time, as, for example, in the frequent occurrence of the cholera at Bellary, in India, where an English fort is built upon a granite rock 500 feet high; but in this case, as probably in all other similar exceptional cases, a sufficient purely local cause can be found, and the exceptions do not affect the value of the general law which has been stated.

Need I remind you, gentlemen, of the terrible fatality of this scourge at Toledo and Sandusky, Ohio, in 1849, in the

latter of which cities alone seventeen physicians died of the disease? Both of these towns are situated upon low and exceedingly rich alluvial plains.

As to the effect of a fresh exposure of an alluvial soil, or of soils more or less impregnated with decaying vegetable matter, permit me to refer briefly to an experience at Buffalo.

On Saturday, July 24, 1852, a ditch was commenced for the purpose of laying pipes through Ellicott Street, Buffalo. On Monday the work was renewed, and it was opened completely on Tuesday. The excavations brought to the surface a large amount of alluvium underlying made ground of clay and sand. The cholera was prevailing in a mild form in some other parts of the city; but Ellicott Street had always been regarded as healthy, and had almost entirely escaped in previous epidemics. It was occupied by the best class of citizens. There were twenty residences upon the portion of this street corresponding with the ditch. On Monday the first case of cholera occurred among the residents, and on this and the two following days there were nineteen cases and nine deaths. The ditch was closed, by order of the Mayor, on Wednesday, and from this date there were no new cases.*

11. There has been as yet no specific discovered for the treatment of Asiatic cholera. Nor can we entertain much hope that there ever will be. Science has hitherto brought to our knowledge very few specifics for disease, and none have ever been found for any of the infectious epidemic diseases; and, considering the great number of medical men who have earnestly sought to discover a specific for cholera, and the infinity variety of medicines which have been employed, it would seem that there could remain but little ground of hope that it would ever be discovered.

We have learned from clinical experience, however, in the case of cholera, much more than we have learned in the case of any other infectious epidemic malady. We can not

* Buffalo Med. Journal, September, 1852, p. 223. My report to the Buffalo Medical Association.

terminate abruptly or abort the small-pox, measles, chicken-pox, or scarlatina. We can only control or modify them, so as to conduct them to safe terminations at their allotted periods. On the contrary, we can and do generally abort the cholera. A large majority of those who are treated by appropriate remedies, and especially if removed promptly from the influence of predisposing causes, recover quickly. To justify a denial of this, it will be necessary to assume that the diarrhœa which, in most cases, precedes the vomiting and collapse, does not usually indicate the presence of the choleraic virus in the system—an assumption which implies that the cholera, unlike nearly all other diseases, has no admonitory prodromes. Such an assumption is unreasonable, and is not warranted by any facts of observation.

It is not often that a patient is saved to whom remedies are not applied until the algid period, or period of collapse, has arrived; but a large proportion are saved by appropriate remedies employed in the earlier stages of the disease. Dr. Yale, in the report on the cholera at Blackwell's Island, hereafter to be referred to, says that, of those brought first to the "diarrhœa hospital," not one died..

The means which have been most successfully employed are essentially those which have long been known to be successful in the treatment of diarrhœa, cholera morbus, and other allied affections. According, to my observation, the remedies which have proved most efficient prior to the period of collapse are opium and absolute rest. Opium, in a solid form, should be preferred to morphine, as being less likely to provoke nausea. It should be given to adults, in doses of from half a grain to a grain, every three or four hours until the diarrhœa is restrained, or until *moderate* narcosis is produced. The production of excessive narcosis is seldom or never judicious, nor should the opiates, as a rule, be stopped suddenly, lest in either case nausea should ensue. Under no circumstances should the patient be permitted to rise, or even to occupy the sitting posture, after taking opium. If for any reason tincture of opium is preferred, it should be combined with tincture of ginger or some

other diffusible stimulant. If morphine is used, it should be placed upon the tongue dry, and swallowed with not more than a teaspoonful of water.

As in ordinary diarrhœa, so also in the early stages of the diarrhœa of cholera, in case the stomach or bowels are known to contain highly irritating ingesta, a single brisk cathartic may be first given, and this to be followed, after a sufficient evacuation, by the opiate.

It is not intended to say that other medicines may not sometimes control the premonitory diarrhœa, but only that the writer has found the simple formula described the best.

If one should wish to render the theory of this treatment consistent with the theory of the existence of a cholera germ it is only necessary to suppose, what seems probable, that the period of life, or of activity of the germ in the human system, is brief, and that the opium holds the secretions in a normal condition until the germ perishes or the force of its virus is expended.

There is much clinical experience which tends to show that in the human system the period of life or of activity of the germ is brief; and to this we may add one of the conclusions of the French Commission already referred to, namely, that "the blood of a choleraic patient, by cultivation, after a few hours loses its infectious properties."

We may also, I am persuaded, diminish the severity of an attack or arrest its progress by the prompt removal of the patient outside of those atmospheric, telluric, and other influences which are known to cause the development and propagation of the cholera.

12. Removal of an infected person to a perfectly healthy region—that is, a region supplying none of the conditions favorable to the development and propagation of the disease which has been named—does not in most cases cause a propagation of the disease in that region; but, like brands scattered abroad from burning buildings, provided they are not thrown among material already in a proper condition for combustion, they usually cause no further mischief.

LESSONS TAUGHT BY THE SUSPENSION BRIDGE EPIDEMIC.

The inferences to be drawn from the Suspension Bridge epidemic, so far as they have any bearing upon the opinions expressed in this paper, are confirmatory. They may be briefly stated as follows:

1. The cholera germ was brought by the emigrants who were temporarily detained near the settlement of laborers, the first case occurring among the emigrants. So far as can be learned, the emigrants had not suffered from the cholera before, nor did they after leaving Suspension Bridge. Upon this point our information is not positive and definite; but, at any rate I feel justified in saying that the cholera, if it existed among them before or after their detention, was not in such a degree as to attract the attention of the railroad officials or of others; and this is all that it is necessary to establish for the purpose of my argument. It exhibited no virulence until it was communicated to the Suspension Bridge laborers.

2. That the emanations from a large amount of lately upturned soil, containing more or less decaying vegetable matter, contributed to the propagation and malignancy of the disease.

3. That the elevated temperature, together with the moisture of the atmosphere, constituted an important factor in the causation—a condition, however, which was not limited to this precise locality, although on these low lands bordering the river these conditions were most intense.

4. Dissemination of the infected, or of those persons who might be presumed or were known to carry with them the cholera-germ, did not propagate the disease—or at least in only a very few instances—to places where the topographical conditions were more favorable—and in these isolated examples no epidemics resulted.

WHAT HAVE WE TO APPREHEND IN CASE IT APPEARS AGAIN IN THIS CITY?

To the question which may appropriately be asked in this connection, In case the cholera reappears in this city, is

there danger that it will prove as destructive as it has proved to be in the last epidemics at Naples, Toulon, Marseilles, and in some other towns of Southern France and Italy? I reply, No; and for the reasons that our climate is more favorable, our system of sewerage is better, there are no portions of the city which are relatively so low as to become the recipients of the drainage of the higher portions, we have a smaller proportion of very poor and personally unclean citizens, and finally, because experience has shown that here, at least, the prompt application of judicious sanitary measures is certain to prevent the spread of the disease.

It would be an affectation of modesty on my part if I were to omit to refer, in confirmation of this statement, to the sudden and violent outbreak of cholera which occurred in the Workhouse on Blackwell's Island, and to its speedy arrest under the application and enforcement of sanitary measures.

The cholera had appeared in great severity and malignancy at the Workhouse, and was spreading rapidly over the Island. On the first day of August there were 29 new cases and 10 deaths at the Workhouse. On the 2d there were 33 new cases and 14 deaths. I was at that time chairman of the Committee of Inspection for the Islands, and on the morning of this day the Commissioners of Charities and Correction placed Blackwell's Island unreservedly under my control, so far as its sanitary condition was concerned. On the next day the most important sanitary changes had been made, some of which were very radical, and were in operation. At the close of this day there were reported 30 new cases and 13 deaths; on the following day, August 4th, there were 21 new cases and 4 deaths; on the 5th there were 12 new cases and 7 deaths; on the 6th there were 4 new cases and 3 deaths, and on the 7th, 1 new case and 1 death. Thereafter, until September 23, a period of forty-six days, there were 27 new cases, or considerably less than one a day, after which it ceased altogether.

Dr. Leroy M. Yale, who was at that time one of the four-

teen house surgeons upon the Island, and who remained on duty to the close of the epidemic, made, by request of the Commissioners, a report upon the subject of the epidemic. This report, published subsequently by the Commissioners, is remarkable for the minuteness and accuracy of its statistical labor, and for the value of its many and carefully drawn conclusions. On the 7th day of August, the fourth day after the introduction of the most important sanitary changes, he reports, "the epidemic was virtually at an end." *

But this illustration of what may be accomplished, at least in our climate, is unimportant as compared with what has been done in this great city by the intelligent and energetic action of our Board of Health. Again and again the cholera has appeared in the lower parts of the city, and especially in our crowded tenement-houses, and as often has it been confined to the narrowest limits or speedily "stamped out."

In concluding, gentlemen, I wish to repeat, what I have intimated before, that I know too well the value of the services which the students in microscopy have rendered to our difficult science to permit me to say one word which could in any way be construed into a lack of appreciation of their skillful, painstaking, and, in this country generally, unrequited labors; but, while we are hopefully waiting the disclosures of this important branch of our science, we must not neglect to give attention to the suggestions and demonstrations of clinical experience, especially when, as in the case of the Asiatic cholera, they have not been by any means barren of practical results.

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* Annual Report of the Commissioners of Public Charities and Correction, 1866, p. xv; also pp. 109—197.

THE SURGICAL MANAGEMENT OF RACHITIC DEFORMITIES OF THE LOWER EXTREMITIES.

By V. P. GIBNEY, M.D.,

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It is my impression that the subject of Osteotomy for genu-valgum and genu-varum has not been discussed in any of the New York societies except the Surgical. Certainly the Academy of Medicine has not contributed anything to science bearing upon the question, and I therefore ask no pardon for presenting this evening a paper on the Surgical Management of Rachitic Deformities of the Lower Extremities.

If my paper shall serve to bring out a discussion among men whose experience is large and valuable, if some, as yet, mooted points can be settled within this hall so far as the weight of statistics and opinion can settle any point, if aught can be added, however small, to our stock of information on the subject of bow-legs, of knock-knee, and of other curves of the lower extremities, I shall feel that I have not written in vain.

By way of definition let me state that in the employment of the terms Surgical Management I wish to convey the impression that mechanical appliances as well as cutting instruments, are surgical means for effecting relief. He who devises and applies apparatus to meet indications, may be just as much a surgeon as he who wields the scalpel, the

osteotome and the mallet. It requires as much skill, ay, more skill, to make a simple fracture always at the epiphysial line, than to make a compound fracture at this point.

If then I speak of braces, splints and osteoclasts, do not think that I am digressing. All these belong to the armamentarium of the surgeon.

For the reason that a large proportion of bone curves and epiphysial changes in the lower extremities are found in children who have been or are rachitic, and for the reason that the surgical treatment is the same whether the curve be rachitic or otherwise, I have advisedly made use of the above terms in the selection of my title.

Despite the teachings of gentlemen who practice osteotomy, the great bulk of the profession, I am convinced, hold to the opinion that every case of knock-knee or of bow-legs does not demand surgical interference. Exaggerated cases are known to recover spontaneously, and there are practitioners who believe this, and discountenance the use of splints or the resort to operation.

Accordingly I have thought it desirable to raise the question:—

1. What cases can be safely left to nature?

When I have asserted that many children do recover from deformity without any treatment whatever, I am met with the reply "They did not have true cases of knock-knee or of bow-legs. The term knock-knee is the vulgar name for Entogonyaneon, (Esogonyancon - Macewen), genu-valgum or genu-introrsum.

Dunglison—our American authority on definitions—gives Entogonyancon (I hope I shall not have to use this term again!) as meaning "bending of the knees inward."

Dr. William J. Little employs the term "In-knee" and has written an excellent brochure on "In-knee deviation." He means a "distortion of the *knee joint*," and hence his definition includes many deformities we are loth to speak of as knock-knee.

Dr. William Macewen defines by describing in the following language: "In the normal limb, a line drawn from the

head of the femur to the middle of the ankle-joint passes through the centre of the knee-joint; in knock-knee the middle of the knee-joint is thrown to the inner side of this line."

Dr. Poore, the most recent author, gives as definition: "A deformity at the knee-joint in which a line drawn from the head of the femur to the middle of the ankle-joint, passes outside the centre of the knee-joint, and in which the internal malleoli can not be made to touch when the limbs are in an extended position."

In the next paragraph he modifies this by stating that "not all cases of in-knee are cases of true genu-valgum." By this he excludes "spastic contraction," some cases of disease of the knee-joint, etc. His definition does not include as much as does Dr. Little's.

However, it is well understood by practitioners what is meant by knock-knee, and as my remarks just now concern the cases that recover spontaneously, there is no occasion for including deformities due to the diseases I have mentioned.

Do any cases of knock-knee—true knock-knee—recover spontaneously?

It is my opinion—indeed, my opinion takes the form of a strong conviction—that a fair proportion of the cases of knock-knee in children in the United States make a spontaneous recovery. Let me give my reasons.

1. From 1871 to 1877 inclusive, I saw at the Hospital for the Ruptured and Crippled, two hundred and fifty-five cases of genu-valgum in children under fourteen years of age.

This period antedated the advent of osteotomy as a means of redressing these deformities. This represents a period, too, in which the apparatus employed for relief was theoretically inoperative. Practically it seemed to be of service. The patients wore the springs from six to eighteen months, and in many, yes, in most all, the limbs were restored to normal condition. The construction of the appliance is as follows: Steel bars of medium strength extending along the outer sides of the limbs from foot-plate to pelvic band with

joint at ankle, knee, and hip, permitting the fullest range of flexion and extension. Like bars along the inside, reaching from the ankle-joint to the upper third of the thigh, and joined to the outer springs by means of semi-circular steel bands at the upper extremity and at the calf. A joint at the knee, at which point a small pad was attached not pressing firmly against the inner condyle. Both these springs were attached at the ankle to a foot-piece which was worn within the shoe. We had then a pair of springs simply supporting the limbs without exerting any force against the deformity.

Since 1877, these springs have been modified by dispensing with the perineal band and by attaching a pad at the upper end of each outer vertical bar, which pad pressed against the trochanter, while force is employed against the inner side of the knee by means of a strong canvas band fastened to the outer bar and laced firmly in front.

Theoretically we have now a force acting continuously against the apex of the angle formed by leg and thigh. And yet I do not believe that our percentage of cures is greater now than it was prior to these changes in the apparatus employed. On more than one occasion I have applied a good fitting pair of springs to a typical case, to learn a year or two subsequently that they were discarded within a week, and to find the limbs straight.

Another reason for believing that spontaneous cures frequently take place is the scarcity of adult cases in this city. Comparatively few patients over ten years of age are presented for treatment, and it is seldom that one sees on our streets, go into what ward one may, an adult with this deformity. Two years ago while visiting nearly every part of the city in quest of old hip cases, I seldom saw a case of knock-knees in any but young children.

My own observations I am confident will be confirmed by the major portion of my audience. Without resorting to statistics I feel safe in asserting that the larger number of cases in which osteotomy has been performed, in this country at least, have been in children from three to eight years of age.

During the period I have named, viz., from 1871 to 1877, I saw only eighteen cases in patients between fourteen and twenty-one years, and only three in patients over twenty-one years of age.

Of the whole number (276) treated it will be seen that two hundred and fifty-five were in children under fourteen years of age. The yearly reports give fifteen of the entire number (276) as not cured, and on closer study I find that this fifteen occurred in the twenty-one over fourteen years of age. Lest some one may get the impression that I assert that not one out of the 255 failed to recover, I will correct that impression by stating that none were recorded as unrelieved.

Statistics of dispensary cases not traced for final results are sometimes peculiarly misleading. Because a patient does not return, it does not follow by any system of reasoning that a cure has taken place.

This question might, however, be a pertinent one: If these patients were not restored why do we not find many now farther advanced in life presenting genu-valgum?

I am therefore all the more willing to accept the statement of family practitioners that many cases of genu-valgum do recover spontaneously.

Take again—bow-legs. I am sure that many gentlemen present this evening can tell us of children whose limbs were bowed, but are now straight without any treatment.

During the seven years immediately preceding the introduction of osteotomy for this deformity, from 1871—1877, I saw at the hospital one thousand and five cases of bow-legs, nine hundred and ninety-seven of which were in children under fourteen years of age. I saw only three in adults, and only five in patients from fourteen to twenty-one years of age. Many—the larger proportion of the nine hundred and ninety-seven—came under treatment, and a good proportion never carried out the same. As a matter of clinical fact their ages ranged from two to four years. Either the apparatus was very efficient, or the limbs became straight. These patients should now range from seven to ten years of age, and I think it would to-day be an unenvi-

able task to find half as many bow-legged children between seven and ten years of age. I think I shall not be corrected if I say that the great majority of patients operated upon in this city since 1879, have been under seven years of age. Among our own people bow-legs in adults are very rare. Occasionally one does find a case in a half-grown boy or girl.

The question then: What cases can safely be left to nature? becomes very pertinent.

1. Children under two years of age presenting bow-legs, or knock-knees, should not, I think, be subjected to operation or to mechanical treatment, unless the deformity be very exaggerated.

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2. Children under three years of age with only a moderate degree of deformity can, in my opinion be safely left to nature. My plan is to take the outline of the deformity on a page of my record book, then with my hands I learn the strength of the bones—determining the springiness of the limbs. If I find the deformity slight—my advice is to defer the mechanical treatment, and to bring the patient in a month or two for observation. It is seldom that I find occasion, by comparison of tracings from time to time, to employ apparatus.

In bow-legs we have often a general curve extending from the perineum to the ankle, without any sharp deviations whatever, and again there are many where the tibia and fibula are sharply curved at the junction of the middle with the lower third of the leg. In the former I rarely find it necessary to employ any form of apparatus, in the latter I rarely omit to order apparatus. In the former, Nature, according to my observation, corrects the deformity so thoroughly that one cannot find traces of the original deviation: in the latter, if treatment be rejected the curve nearly always remains, and as the child grows in height the curve becomes longer and hence less conspicuous.

Knock-knees and bow-legs being more or less due to rachitis, we naturally expect medication and hygiene to play a conspicuous part in their therapeutics. The general practitioner treats his cases in this way so long as the deformity

is not too glaring. Rickets, being a mal-nutrition, calls for such drugs as will assist the digestive powers and such hygienic measures as will contribute to this end. The fact that these deformities are more common in the crowded districts of large cities, furnishes an indication for rational treatment.

I know of many cases without marked bony changes cured during a season in the country. Knock-knees where it is difficult to find any antero-lateral curvature in the femur, any abnormal elongation of the internal condyle or any elongation of the inner head of the tibia are often corrected in apparently shorter time.

Bow-legs without sharp curves in the lower third of the leg, sometimes disappear completely during a sojourn in the country. A few years ago in a discussion on Rickets at the County Medical Society, I heard a distinguished surgeon from the South-west say that there were no bow-legs in his section of the country.

The phosphates of lime and soda are thought to have a specific action on the bony structure, and are largely administered. I have used them long and persistently, and am satisfied that their only action is on the digestion. Cod-liver oil need only be mentioned, as all men recognize this nutrient as of inestimable value.

It has been my custom to employ manual force in the correction of these rachitic deformities under the following circumstances.

1. To patients whose parents were unable to buy apparatus, and too improvident to give any attention to its care.

2. Where one has little time in which to effect a cure.

3. In cases where the bones will thus yield to such force, the other two conditions being present.

Let the following case serve as illustration:

Last May an Italian woman, accompanied by an interpreter, brought a female child aged four years to my clinic, and the limbs were thus deformed:

1. Both humeri were curved forward and laterally about the juncture of the upper and middle thirds.

2. The bones of the forearm both sides were bowed outwardly near the middle.

3. The femora presented an antero-lateral curvature near the middle, and the deformity gave rise to a marked genu-valgum.

4. Both legs were bowed in the lower third, the curve being quite sharp.

In addition to the deformities already named, the spinal column presented a marked ryphosis which disappeared on traction.

The child was eminently rachitic, and being four years of age, demanded some surgical means of relief. The patient's address was given as in the Italian quarter in Baxter Street. Had I wished to employ apparatus, I saw no way of securing it, were it ever so inexpensive. The bones I found would yield considerably when I tested them with my hands.

Accordingly, on the 17th of May, at the Polyclinic, I easily made simple fracture under chloroform with manual force of the following bones: Tibia and fibula on both sides; both femora; radius and ulna on right side. Green-stick fractures were made of the right humerus, left humerus and radius and ulna on left side. The whole operation occupied about ten minutes. Borated cotton was applied smoothly about the limbs after the deformity was corrected and plaster of Paris bandages served as retentive splints. I ordered an opiate, and the child was bundled up well and taken home, late in the afternoon. Next day, Dr. Thomas Stone, of my clinical staff, went down to the address on Baxter Street and learned that the child lived in New Jersey, whence it had been taken early that morning. On the second day he succeeded in finding the family, and barring a little œdema of hands and feet, the case was doing surprisingly well. The rectal temperature was 98⅘°. On the seventh day, I removed the plaster dressings from the lower limbs for inspection, and found the deformity not entirely overcome on the right side, while that of the left side had entirely disappeared. It required very little force to straighten the right limb. Fresh plaster was applied, and on the twenty-first of June all dressings were removed. During all

this time and subsequently, cod-liver oil and the compound syrup of the hypophosphites were administered at the usual intervals. The child grew fat and continues under observation, but at present I find that the thighs in their upper portion present quite a sharp antero-lateral curvature, and the arms present a moderate degree of deformity. My error was in not carrying my splints above the hips. I have accordingly made a very simple modification of the wire cuirass, viz: a double hip splint, originating in the Boston hospitals, and I propose to correct the deformity of the thighs again, and retain the good position secured.

During the summer, I also corrected by manual force a case of bow-legs in a two-and-a-half year old child, at the Nursery and Child's Hospital. In this case the deformity was in the lower third of the leg, and it was important to afford relief in less time than splints would require.

A French writer on these deformities teaches that the best way is the quickest way, and a simple fracture can often be made in marked cases of deformity, by manual force, while the treatment of the fracture is very simple. The plaster splint as devised and so successfully used by Dr. Little, of this city, places these lesions of our own making, under absolute control. Even the plaster of Paris bandage, when smoothly and neatly applied, serves to bring about perfect union. Other means of dressing will, of course, suggest themselves as one's taste inclines.

In correcting genu-valgum, this manual force is often practiced and is known as Delores' method, or, osteoclasic manuelle.

Epiphysial fractures are produced frequently, ligaments are torn, and joints rendered very unsteady. Dr. Macewen concludes a survey of the method of Redressement forcé, by the following remarks:

"It may safely be concluded that osteoclasic manuelle, or, mécanique, has served its time, and cannot be practised in the presence of the more exact methods of the present day."

From my own experience in redressing genu-valjum, in this way and from the drift of sentiment, oral and written, I

am well assured that Macewen's conclusions in 1880, the date of the publication of his work, will be warmly seconded at the close of 1884.

Among the more enthusiastic advocates of mechanical appliances, for the gradual correction of these deformities, Dr. Wm. J. Little, of London, stands at the head.

The orthopedist, as a rule, is more or less committed to the employment of springs, in these as well as in other deformities.

Certain cases demand apparatus, and this is sometimes an important point in diagnosis. Surgeons who have performed osteotomy very extensively, agree upon that age, when the bones yield to a moderate manual force, as the age for the employment of springs. Dr. Poore, for instance, believes that in a rickety child, yielding of the bones will be felt up to the fifth or sixth year. This author is not so much opposed to the use of splints as is Dr. Macewen. The latter speaking of their use says: "Good results in isolated cases, are spoken of as having occurred; personally, I have not seen any." [Osteotomy, p. 93.]

In this city, at least, I am sure that the custom is to apply springs to children thus afflicted, at any time between the second and eighth year.

The rule at the Forty-second Street hospital is to reject cases in patients over three years of age. The rule, however, is honored more in the breach than in the observance. Clinically, five years seems to be the limit at this institution. My own rule is to employ springs, if I find the bones can be sprung with moderate manual force. We can test the bone in this manner, with very little pain. I am referring now to the bow-legs. If I find the femur curved and the inner condyle unusually long, in a case of knock-knees, I test with my hands the ligaments of the knee, and the femoral curve, and am guided in my selection of cases, for apparatus. The age beyond which I find this test failing, is from four to five years. While an interne at the hospital I had abundant opportunity of testing limbs, and the tracings on my records made from time to time in cases under treatment, but con-

firm me in the adoption of this test for my guide. My friend, Dr. Poore, I find, is guided by the same test. At the out-door department of the hospital it is customary to refer to other hospitals for osteotomy children over four years of age in whom these deformities are aggravated forms.

At the New York Orthopædic Dispensary very few cases are rejected, judging from Dr. Shaffer's very instructive paper on this Subject published in *The American Journal of Obstetrics and Diseases of Women and Children*, for July, 1881.

Dr. Little assigns no limit as regards age. He does what many of us do, viz :—use splints first, and these failing within a few months, resorts to operation. His success, however, prompts him to undertake cases that many orthopedists in this country would relegate to the domain of Operative Surgery.

At this point a discussion as to the forms of apparatus employed, the advantages claimed for each, and the principles involved will help to determine what cases can be corrected.

All the springs now in use, are constructed, I believe, on one principle. This principle is force brought to bear against the convexity of the curve at its apex. One class of springs is intended to exert moderate, but continuous pressure, while another class is intended to exert exaggerated pressure for a few seconds or minutes (Shaffer) in the direction opposed to the deformity.

If it be necessary to confine a patient to bed, an ordinary side splint serves an admirable purpose : for with this a roller or rubber bandage, or straps and buckles will exert as much pressure as can be tolerated. Dr. Little employs continuous pressure, and he represents the views of the larger proportion, by far, of the Orthopedic Surgeons. Dr. Shaffer represents the views of those who advocate the exaggerated momentary pressure.

About the simplest form of portable springs for continuous pressure, are those in use at the Forty-second Street

Hospital. Concerning their efficiency, I can speak quite positively.

The points of counter-pressure in a case of genu-valgum, are the trochanter and the outer ankle; and in a case of bow-legs, the inner condyle of the femur, or the space immediately above this and the inner ankle. The ankle in each instance, is protected by a steel foot-plate and heel cup, which is worn within the shoe. The two vertical pieces are of bar steel, without special polish, and are joined at the top by a semi-circular band, passing about the posterior surface of the thigh for knock-knees, and the calf for bow-legs. At the lower end they are fastened by a rivet with washer, making a free joint opposite the ankle. The apparatus is held in position by straps continuous with this semi-circular steel band, and passing over the front of the limb, to fasten by buckle or knob, to the other end of the band. The foot is held in place by an instep pad, the straps from which pass on either side through the space between the foot-plate and the heel band, to be brought over the outer side of the upright bars, and tied on the pad already mentioned. At the upper end of this vertical bar for counter-pressure, is a pad. Pressure is brought to bear now against the convexity of the curve, by means of a broad band of canvas, or leather, fastened to the outer vertical bar for knock-knees, to the inner for bow-legs, which band is brought now about the limb to lace in front. In other words, this band, or belt, passes, in the case of knock-knees on the outer side of the outer bar, and inner side of the inner bar, and vice versa for bow-legs.

These springs can be covered with material to suit one's taste, and finished to please the most fastidious. In ordering apparatus from any surgical instrument maker, one should give a drawing and measurements, aiming to meet the therapeutical indications that the case presents. Catalogues can be readily obtained from any of the prominent instrument makers, and modifications of apparatus figured, will always be made when ordered. I have thus described one form of appliance, with the idea of giving the general underlying principle, rather than of recommending any special make.

The splint employed at the New York Orthopædic Dispensary and Hospital, is fully described by Dr. Shaffer in the paper to which I have already referred. Dr. Poore finds by consulting published statistics, that the percentage of cures in genu-valgum is not quite 30 per cent.

I very much regret that I have nothing statistical to contribute, bearing upon the percentage of cures. To secure reliable data of this kind, more time is required than I have at my disposal.

OSTEOCLASIS.—This operation has certainly not become popular in this country. Naturally, one would prefer a simple fracture to a compound, and yet, for some reason, comparatively few surgeons resort to osteoclasis.

The perfection of French instruments has rendered the operation a popular one in France. Osteoclasts in this country do not give the results we are led to expect. Until we can have as complete an instrument as that of Robin of Lyons, osteotomy will continue to be the operation for correction of femoral and tibial curves.

The various instruments are fully described in Dr. Poore's work, and need not be described in detail this evening.

OSTEOTOMY.—This operation has become applicable to nearly all rachitic deformities of the extremities. There are very few surgeons but have become familiar with it either for knock-knees or for bow-legs. The literature is abundant, and the instruments employed, as well as the mode of operating, are familiar to all. I certainly would not attempt to tell the Fellows of this academy how to operate, when whole chapters in recent works discuss this point in the fullest of detail. It is with results that I shall deal, and in speaking of those for the relief of genu-valgum I can do no better than ask you to note with me some statistics Dr. Macewen presented at the recent meeting of the International Medical Congress held in Copenhagen. In 820 personal supracondyloid osteotomies there were only eight cases in which suppuration took place, and in six of these the cause was attributed to extra force applied under accidental circumstances. He had only one relapse, had hemorrhage in none.

Five died, but in not one was the fatal result due to the operation. In 580 additional cases collected from British surgeons he finds hemorrhage in only two instances, suppuration in forty, and relapse in five, while in two there was ankylosis, and three died as a result of the operation.

His personal operations were conducted under the spray and with strict Listerian precaution. For full details the Lancet for September 27 can be consulted. There is also an excellent abstract in the Medical News for November.

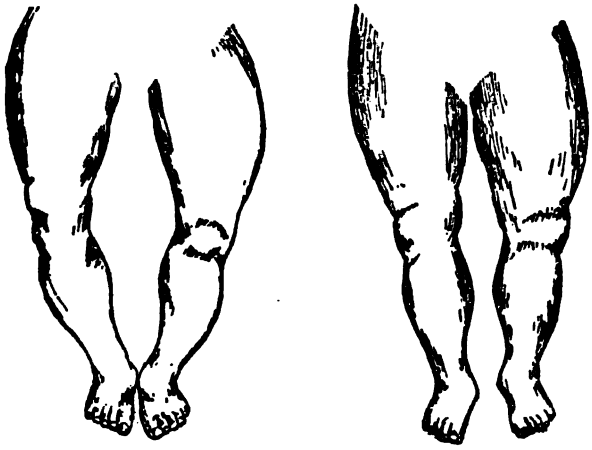
From this abstract I find that profuse and even fatal bleeding may attend this procedure. Langton in the Lancet for March 29, 1884, records a "death after amputation of the thigh, on account of gangrene consequent upon ligation of the popliteal artery, which had been punctured by a sharp spicula of bone which projected from the lower fragment."

Mr. Gill in the Lancet for May 17, of this year, records a case in which the popliteal artery was completely divided, the patient making a good recovery after ligation of both ends.

Howard Marsh (British Medical Journal, April 5, 1884,) wounded the anastomotica magna, but successfully secured it on the seventh day. A friend in this city tells me that he has divided this artery. In a case of my own I had most alarming hemorrhage from the bone itself, and succeeded only in controlling it by packing a sponge covered with iodoform between the cut surfaces. This is the only case in which I have had any hemorrhage that gave the least annoyance. The case in which I had the bone hemorrhage was in an Italian girl aged seven and a half years. I did the supra-condyloid operation on account of a marked symmetrical antero-lateral curvature of the femur, and but for this annoying hemorrhage would have also done Shede's operation on the tibiæ, inasmuch as sharp tibial nodes, or exostoses, existed on the anterior and inner aspects of these bones at the junction of the upper with the middle third. The result has been good so far as the femoral curves are concerned, but there is still a well-marked genu-valgum depend-

ent on the tibial curves. A detailed account of my osteotomies would be premature, as I have only enjoyed this privilege during the present year.

In February I did a double cuneiform osteotomy in private practice on a case that I had had under mechanical treatment for twelve months. And let me here remark that I have never seen an anterior tibial curve corrected by apparatus. This is pre-eminently one of the rachitic deformities that mechanical appliances will not, so far as my observation goes, make any impression upon. The result of the cuneiform osteotomy was good, and all appliances have long since been discarded. In only one instance have I had a hospital case to treat, and it is to my friends Drs. Chauveau and Adam that I am indebted for the courtesies of the French Hospital.



In March I operated on a nineteen year old lad for the relief of bow-legs, and the section through his tibiæ was tedious in the extreme. The relief has been greater than was anticipated; for not only is the deformity entirely overcome, but his gait is far better than it ever was. [The accompanying sketches, made by Dr. Van Schaik on March 11, the day of operation, and on August 18, four months after removal of all support].

It is interesting to note that I have done nine linear osteotomies, and two cuneiform osteotomies during the past six months at the Polyclinic, and sent the patients home as soon as the plaster dressing had become hard enough. In none was there any temperature above 102°.

In a supra-condyloid osteotomy I have had a unique accident, so far as I can learn. The accident was a paralysis of the external perineal nerve first appearing at the end of the third week. The operation was done on Aug. 7th and on Sept. 3rd, having seen the case several times in the interval, I fancied that there was a slight paralysis of the anterior tibial group of muscles. A more careful examination was instituted on September 4th, and it required a very strong Faradic current to get any response in this group.

On the 17th Dr. Starr tested the case electrically and found faradic contractility absent in the anterior tibial group, very much diminished in the perineals and posterior tibial. In the anterior tibial group he found with galvanism, the reaction of degeneration. The whole leg, and indeed the thigh, seemed powerless; under electrical treatment and apparatus to retain foot in normal position, the limb has been restored. Nov. 8th, the cure was nearly complete.

In view of the invasion of the paralysis after three weeks had elapsed and its disappearance two months later I can see no other explanation than the injury to the nerve by the occurrence of callus.

The lessons I have learned from my own operations are:

1. Exaggerate the correction of the deformity.

2. Examine limb at the end of a week to ascertain whether the amount of correction gained is the amount desired.

3. Do not hesitate to refracture by manual force if it be necessary.

4. With strict attention to details in operating, and in the use of good plaster of Paris bandages well applied, cases can be treated in dispensary nearly as well as in hospital.

5. In dispensary cases do all the operating you propose to do at one sitting.

I am still convinced that one loses nothing by following

Lister as closely as it is possible to follow. If cleanliness in all particulars is Listerism then be cleanly in every particular.

I am satisfied that the best results are obtained in this way, and I propose to leave no stone unturned to secure the best possible results. Three months' support, in some form of splint, subsequent to the operation, is not too long.

The paper of Macewen at the International Congress compelled all men to admit that the supra-condyloid operation was, *par excellence*, the operation for genu-valgum.

I have made no reference to the instruments employed for the reason that the osteotome either of Macewen or Poore is the only one used.

As I am completing this paper, my friend, Dr. Shrady, permits me to inspect his new saw, and it seems that it is all that could be desired in a saw. The chisel or osteotome has taken the place of the saw, because no bone dust is left to interfere with the healing of the bone.

If I have not given credit to the work of surgeons in this city it is because I expect them here this evening to speak for themselves.

IS THE OPERATION OF TRACHEOTOMY IN DIPHTHERITIC CROUP DANGEROUS? WHEN SHOULD THE OPERATION BE PERFORMED?*

By JOSEPH E. WINTERS, M.D.,

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At the March meeting of the Obstetrical Section of this Academy it was stated† that "tracheotomy is an operation attended with great immediate danger to the life of the patient."‡ This statement was so startling to me, and so at variance with my impressions from reading, and from my own personal experience, that I believed it to be erroneous. The opinion that tracheotomy is a dangerous surgical operation I believe has no valid foundation, nor will it bear the test of a close examination, and should not be accepted with the confidence with which it seemed to be received in this hall last March.

The speaker, in the closing discussion, in corroboration of his opinion, quoted Mr. Timothy Holmes, of London, as saying that the operation is the most dangerous of any in the surgery. On page 303 of Mr. Holmes' work on the

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* Read before the Section of Obstetrics and Diseases of Women and Children, New York Academy of Medicine, October 23d; and by invitation was re-read before the Academy at large, December 4th.

† Dr. Ripley, Medical Record, April 5, 1884, page 369.

‡ "The operation of tracheotomy in young children for croup, in its imminent peril to life, is one of the most dangerous operations in surgery." (Dr. Ripley, Medical Record, July 31, 1880, page 118.)

"Surgical Treatment on Diseases of Children" will be found the following: "I think that, of all the operations which we are commonly called upon to perform on children, tracheotomy is the most dangerous, both in its immediate performance and in its secondary complications." And further, "I would not recommend tracheotomy while any prospect of recovery existed otherwise." If this suggestion of Mr. Holmes is followed, *delay* in the performance of the operation should be ascribed as the cause of both the secondary complications, and of death, rather than the operation itself. On page 302 he says: "In thirty-one cases the causes of death have been noted; and in *very few* of these cases was the cause of death connected in any way with the operation." . . . The original disease caused death in fourteen cases, "pneumonia and catarrh in twelve, scarlet-fever in three, collapse of the lung in one, secondary hemorrhage (fifth day) in one," making the total number thirty-one, in none of which was the cause of death in any way connected with the performance of the operation, for Mr. Holmes states on page 326 that the ulceration which caused the secondary hemorrhage was produced by the tube. On page 316 he says: "Considering the risk of operating below the thyroid isthmus, and the large size and vascularity of that body at an early age, I would urge the propriety of making the opening above the isthmus. . . . After the age of five, or thereabouts, the surgeon can, if he prefer it, open the trachea below the thyroid isthmus. But I do not myself recommend this operation, at any rate before puberty." On page 318 it is stated: "To cut through the isthmus of the thyroid is, in early life, at least a dangerous proceeding."

Speaking of hemorrhage, Mr. Holmes, on page 317, says: "I have three times seen death on the table during tracheotomy; and twice from this cause. In one case in which I was myself the operator, the child was very young (age not given). On exposing the parts, I dared not divide the centre of the thyroid body, on account of its thickness, and the large size of the vessels visible in it. On the other hand, to open the trachea below I had to *plunge* my knife almost be-

neath the sternum. . . . In the incision a vein was cut very near to its opening into the left innominate, and the bleeding proved fatal before I could get the tube in."

In the first volume of Trousseau, page 423, he says: "I have often witnessed the difficulties and dangers of a too nimble tracheotomy, even when performed by an able operator." *

Marsh† says: "It would be nearly as reasonable to cut straight down upon the subclavian artery as to attempt tracheotomy as it is very often performed, and it would be scarcely more dangerous. The amount of hemorrhage during tracheotomy will depend almost entirely on the method of operating."

Mr. Durham ‡ says that of one hundred and eight cases of tracheotomy at Guy's Hospital, performed during a period of twelve years, there was not a single case of serious hemorrhage, and the operations were performed by the house surgeons in a very large proportion of the cases, and that, too, very often under circumstances of peculiar emergency and difficulty.

Of eighty-seven cases reported in vol. ix. of *The Medical Times and Gazette*, collected from various London and provincial hospitals, there was but one case of hemorrhage, and in this Marshall Hall's tracheotome was used, and a vessel cut, ending in fatal hemorrhage. Durham says of this, that it is "an instrument which to mention is to condemn."

Regarding the thyroid isthmus, Trousseau § says: "If the isthmus of the thyroid body presents itself under your bis-

* "Prof. Trousseau, in all his articles, strongly repudiated haste, and . . . spoke words to this effect: 'A certain surgeon (naming him) has reproached me with operating like a physician and not like a surgeon. Well, he had an opportunity, on one occasion, to operate like a surgeon, and with one stroke of his knife he divided the œsophagus as well as the trachea. Some time afterward he lost another patient by hemorrhage during his brilliant operation. Since then M. —— has operated more like a physician, and after a while he will become a very fair tracheotomist'" (Cohen: Croup in its Relations to Tracheotomy, p. 38, Philadelphia, 1874).

† St. Bartholomew's Hospital Reports, vol. iii., p. 334.

‡ The Practitioner, 1869, vol. ii., p. 212.

§ Trousseau in the Union Médicale.

toury, never hesitate to divide it in the mesial line; there is usually an arterial jet as large as a thread, which ceases after some seconds, and by this section you have signally facilitated the operation." Of one hundred and nine tracheotomies for croup in children, Trousseau never found it necessary to have recourse to the ligature or torsion for a single vessel; the hemorrhage always ceased as the canula was introduced.

Holmes, on page 323, says the operator in trying to insert the tube into the trachea sometimes "pushes the canula down the cellular tissue in front of the windpipe, causing pressure on the trachea, and obstructing respiration still further." . . . "The third (case) in which I have seen death during the operation, the fatal event seemed to me due mainly to this error."

One of the three fatal cases of Mr. Holmes, then, was due to what Trousseau would have termed "a too nimble tracheotomy;" and in another, death was caused by pushing the canular into the cellular tissue outside of the trachea, and thus adding to the original difficulty. Comments on Mr. Holmes' tracheotomies are unnecessary.

The speaker then quoted Professor S. D. Gross as saying "the same thing" as Mr. Holmes. In Professor Gross' "Treatise on Foreign Bodies in the Air-Passages," on page 231, regarding tracheotomy in children, he says: "I know hardly an operation in all surgery that I would not rather undertake than this. . . . The amputation of a limb, the extirpation of a glandular tumor, lithotomy, and even the perineal section are *trifling matters* in comparison with tracheotomy in a short, thick-necked and restive child." On pages 232, 233 he says: "The isthmus of the thyroid gland, even when it descends considerably lower than usual, will seldom embarrass our progress; should it do so, it must be held out of the way, although it has sometimes been divided with impunity."

He adds: "Professor Van Buren, of New York, informs me that he has completely divided this process on several occasions without the slightest loss of blood, mischief, or inconvenience." Even after this Professor Gross says: "Gen-

erally, however, it will be well enough to avoid it by holding it out of harm's way; should this, however, be impracticable, any *bleeding* that may be apprehended can be effectually avoided by embracing the part in two ligatures, the knife being *afterwards* carried between them." Here Professor Gross's directions certainly complicate the operation and prolong it unnecessarily.

He next directs that the trachea be held by a tenaculum. The operation is performed with much more ease and safety when the trachea is grasped between the thumb and index-finger of the left hand than when held by the tenaculum. The trachea should never be entered without our being guided by the touch. If the windpipe is very deeply placed, and is not readily brought into view, it may be taken hold of with the double hook below where it is to be opened, and drawn upward and forward until brought into sight. The hook must, however, be held by an assistant, and the operator should keep his thumb and finger on the trachea.

On page 237 Dr. Gross says: "Great care is to be taken not to permit any blood to enter at the artificial opening, as the *smallest* quantity of this fluid may not only induce violent cough and spasm, but instant suffocation." Further: "The best plan to avoid this occurrence is not to injure any vessels, but to hold them carefully out of harm's way; or, where this is impracticable, *to wait until all hemorrhage has ceased before we penetrate the windpipe.*"

With reference to the first of these statements, it is known that the entrance into the trachea of a small quantity of blood is not dangerous, and many operators purposely introduce a quantity of fluid into it to excite cough in order to expel mucus and membrane. Brettonneau even recommended washing out the tube with a solution of nitrate of silver. Next to the hissing sound with which the air enters the opening in the trachea, one of the most striking things in connection with tracheotomy is the violence with which anything entering the trachea is ejected. To wait until all hemorrhage has ceased before opening the windpipe, would,

in many cases, be to wait until the patient is dead. The surest way of arresting hemorrhage is to admit air freely to the lungs, so as to relieve the embarrassed venous circulation, and thus allow the blood to return to the heart. Time spent in trying to stanch the bleeding before opening the windpipe is generally to the injury of the patient.

With reference to this Professor Gross himself says on page 279: "It is worthy of remark that, when the hemorrhage is venous, it generally instantly ceases, even when it is *copious*, the moment the knife penetrates the windpipe." And again on page 266 he says: "I have never experienced the slightest inconvenience from any occurrence of this kind. Several of my operations, in fact, have been nearly bloodless."

Allow me to turn back and repeat a former quotation from Professor Gross, page 231, in order to make a comparison: "I know hardly an operation in all surgery I would not rather undertake than this. . . . . The amputation of a limb, the extirpation of a glandular tumor, lithotomy, and even the perineal section, are trifling matters in comparison with tracheotomy." On page 373 he says: "I am satisfied, from the facts before the profession, that bronchotomy, properly performed, is, in general, a perfectly safe procedure, . . . *and rarely followed by fatal results.*"

Dr. Gross in his book does not report a case of tracheotomy for croup. After making a careful analysis of Dr. Gross' work, I am unwilling to accept his first statement regarding the dangerous character of tracheotomy, particularly when it is made to apply to the operation in croup.

Dr. A. Jacobi was quoted as saying that he never went to a tracheotomy operation without a feeling of fear and trembling. In the extensive writings of Dr. Jacobi on the subject of diphtheria, croup, and tracheotomy, I fail to find any statements which would show that he considers the operation dangerous.

Now let us review the opinions of other authors:

Bretonneau, to whom we are indebted for the revival of tracheotomy in the nineteenth century, does not speak in

any of his five memoirs of the operation as being a dangerous one, nor of skill in its performance being a necessity to insure success; his whole stress is upon the size of the canula, the temperature of the air the patient breathes, and the after-treatment and care. Bretonneau was so clear and decided in his convictions, which were always stated definitely, that had he felt the operation to be a dangerous one, he certainly would have mentioned it in one of his several communications.

Trousseau, whose contributions on tracheotomy have never yet been surpassed, said: "Tracheotomy in itself is an operation which is more delicate than difficult; it requires only care and presence of mind." He then says that he has performed the operation "more than two hundred times," and adds, "I have never had immediate accidents to deplore, except in an adult, who died of syncope at the *moment* I made the section of the skin." And again he says, "I have finished these operations, *apparently* so perilous, without fear and without accident."

M. Emangard* says: "The performance of this operation is exempt from all danger."

Rilliet and Barthez † say: "The operation in itself is not dangerous."

Bouchut, in 1852, said: "This operation is of easy execution—it presents no danger in itself, and if it does not succeed more frequently, it is because the cases in which it is employed are truly beyond the resources of art—the physician ought always to be ready to operate."

West says: "It is admitted on all hands that in itself the operation is not attended by serious hazard; and the uncertainty as to its issue depends not on any defect in the proceeding."

Meigs and Pepper speak in these terms: "*It is the uniform* testimony of those *experienced* in the matter, that the operation is in itself alone but *slightly* dangerous to life."

Vogel tells us that "The operation itself is not attended by any danger to life."

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* Les Annales de la Méd. et Phys. Sep., 1827.

† Dis. of Children, vol. i., p. 386.

Dr. R. M. Edwards said: * "The operation itself is so simple to a man accustomed to handle a scalpel and forceps that it is surprising so much has been written about it, and so many instruments devised to simplify its performance."

Dr. W. H. Day, of the Samaritan Hospital for Children, says: "Tracheotomy in itself is not a dangerous operation."

Mr. Lawrence † says: "We are fully justified in representing the operation of bronchotomy as attended with little pain and no danger. The operation itself is so simple and so easy that there is very little to be said on the mode of executing it."

Conway Evans ‡ says: "That tracheotomy is in itself a very dangerous operation, the tendency of all evidence on the subject tends to disprove." He quotes from Professor Gross' work to show that the operation is not dangerous!

J. H. Pooley, M. D., Professor of Surgery, Starling Medical College§ says: "The operation itself involves very little danger to life."

Wm. M. Mastin, in ‖ an article in which he gives an analysis of eight hundred and sixty-three tracheotomies which he collected with much care, says: "I cannot see . . . how any one will venture to say that tracheotomy is *per se* of particular danger."

Mr. Howard Marsh, ¶ in an article entitled "Tracheotomy in Children, its Method, its Dangers, and its Difficulties," says: "I am convinced that tracheotomy should be regarded as a delicate operation, which requires coolness and caution in its performance, rather than as one that is necessarily either very difficult or very dangerous."

Robert Wm. Parker, Assistant Surgeon of the East London Hospital for Children, says: "By *common* consent the operation itself is not dangerous, and it hardly, if at all, complicates the primary disease which calls for it."

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* In the Edinburgh Med. Journal, October, 1856, vol. ii., part 1, p. 314.

† Med. Chirurg. Trans., vol. vi. 1815.

‡ Edinburgh Med. Journal, January, 1860, vol. v., part 2, p. 623.

§ Richmond and Louisville Med. Journal, June, 1877, p. 517.

‖ Gaillard's Med. Journal, January, 1880, vol. xxix., p. 15.

¶ St. Bartholomew's Hospital Reports, vol. iii.

Thomas King Chambers said: "Tracheotomy is an alarming operation to hear of or to look at, but in reality it is not a dangerous one. . . . Do not, therefore, alarm the patient's friends by speaking of it as 'a last hope' 'a final resource,' or by any similar weak expression."

Let us see what was the verdict of the older authors on this operation. They always spoke from the force of their convictions, and in definite, unmistakable terms.

According to Galen, Asclepiades first invented and performed tracheotomy in cases of quinsy, about 100 B. C. Here the term "quinsy" relates to croup of the present day, for it is described as an affection which "presents no visible appearance either in the swallow or in the throat, which, while narrowing the glottis, renders the voice acute, and quickly manifests symptoms of strangulation."

Cælius Aurelianus says: "In this manner he (Asclepiades) saved a great many persons who were in danger of perishing from suffocation."

Fabricius, in the sixteenth century, said: "The operation is absolutely free from danger. . . . There is no part of the least consequence exposed to injury in this operation." Fabricius was the first who spoke of the canula, and was the inventor of "wings" to prevent it from falling into the trachea."

Casserius said: "Those are both ignorant and timorous who rashly neglect this safe, easy, and often salutary operation. It is easily performed, and cannot give rise to danger. . . . We have nothing to fear from the slight hemorrhage caused by opening the trachea." Casserius introduced the curved canula, and was the first who mentioned the thyroid gland in speaking of the operation.

In 1586 Sanctorius proposed puncture of the trachea with the trocar, which he had invented for performing abdominal paracentesis.

Bartholini entertained doubts respecting the use of the operation in quinsy, especially in infants.

René Moreau, in his reply, March 1, 1646, declared that the operation was neither difficult nor dangerous,and through

his sound reasoning he served to convert Bartholini to the use of the operation.

In 1695 Dekker proposed to perform the operation with a cutting trocar.

Boerhaave,* in the first part of the eighteenth century, said: "The windpipe may be divided without any danger to the patient's life."

Detharding, in 1714, wrote, with reference to tracheotomy: "The skin only is divided, and a small portion of membrane. There is no ground for fear, even from the least dexterous operator. No blood-vessel from which one need fear hemorrhage, no nerve of which the division can produce any inconvenience."

Juncker, in treating of this operation, said: "It does not require great dexterity." The first vertical incision through the cartilages of the trachea was made by him.

In 1750 Dr. Lawrence Heister,† Professor of Physic and Surgery in the University of Helmstadt, wrote: "This is a safe, easy, and often salutary operation." Heister was the first to use the word tracheotomy."

Louis, in the early part of this century, said: "A little consideration as to the parts to be divided and the mode of doing it suffices to show that the operation could not be attended with the least danger."

Mr. Holmes' obvious misconception regarding the performance of tracheotomy, and the contradictory statements made by Professor Gross, show sources of fallacy on their part; and this, with the vast preponderance of authorities against their opinion, wholly overthrows it.

The operation of tracheotomy not being dangerous in itself, nothing connected with its mere performance should influence the time when it is to be resorted to.

How does diphtheria tend to cause death when left to itself? In a very large proportion of the fatal cases, the disease, in young children, ultimately causes death by me-

* Van Swieten's Commentaries upon Boerhaave's Aphorisms, vol. viii., p. 123. Edinburgh, 1776.

† General System of Surgery, fourth edition.

chanically obstructing the passage of air into the lungs. The object of tracheotomy is to supply a provisional air-passage in the place of the obstructed rima-glottidis, so as to allow the disease to run its full course, and to gain time for the administration of remedies; and if it accomplish this, it should be acknowledged, even though the patient should die afterward from the persistence of the original disease, or some of its complications. That it does accomplish this will be seen by the mode of death after the operation. This depends very much upon what time in the course of the disease the operation has been performed; the type of the disease, the condition of the patient, and the care with which the after-treatment has been carried into effect. When the operation has failed to save life, it has been generally either because it was postponed until it was too late, until secondary complications in the bronchi and lungs have arisen, to sudden collapse, to the persistence and extension of the original disease, causing death by asthenia, or acute nephritis and uræmia, or because efficient after-management and care were wanting.

Suppuration in the anterior mediastinum (this generally may be obviated by not extending the superficial incision too near the top of the sternum), erysipelas and gangrene around the wound, and the slipping of the canula from the tracheal opening have been experienced.

I wish you to mark that none of these causes of death are instances of failure of the operation when properly performed, or of its not removing the main source of danger when the disease is left to itself.

The only lesion that causes death, which is directly due to the operation when properly performed, is ulceration of the trachea from the mechanical irritation of the tube.

Vidand, in 1854, and Goupil, in 1856, exhibited before the Anatomical Society of Paris two specimens of ulceration of the trachea after tracheotomy, produced by irritation of the canula.

In 1859 Barthez called attention to this point, still almost unknown.

Roger, in the same year, in a monograph, published an analysis of twenty-one cases of ulceration of the trachea.*

Sanné † in his work reports seventeen cases, collected in the service of Barthez. He says: "More or less redness of the trachea and bronchi have been noted in eleven of seventeen cases, out of which seven were accompanied with broncho-pneumonia. In one case there was abscess of the mediastinum, consecutive to a perforation of the posterior wall of the trachea, and one of œdema of the glottis."

In the Trans. Path. Soc., London, vol. xviii., p. 32, is recorded a case of death from pyœmia after tracheotomy, from ulceration caused by the tube. Two cases have happened in Guy's Hospital, in which ulceration extended through the anterior wall of the trachea into the innominate artery, and fatal hemorrhage of course resulted.

Mr. Marsh reports two instances of ulceration of the trachea out of thirteen operations in his own experience, and makes allusion to three others he has been told of.

There are many cases scattered through the literature on tracheotomy, but these are sufficient for us to recognize its importance, its frequency, and the different ways in which it tends to cause death.

The causes are the shape, the size, and the length of the tracheal tube, so that it presses against the walls of the trachea to the extent of producing mechanical irritation and ulceration.

Roger thinks that a small canula, by allowing of its too free movability and the consequent friction which results from it, can cause ulceration.

The symptoms are expectoration of more or less pure blood, along with the sanguinolent expectoration common to every case of tracheotomy for the first few days, in some cases pain referred to the point where the tube impinges against the wall of the trachea, and dark discoloration of the end of the canula.

The accident can almost always be prevented by having

* Roger introduced the moveable shield in 1859.

† Sanné: Étude sur le Croup, après la Trachéotomie.

the canula short, curved at nearly a right angle,* and of proper size, so as to fit quite accurately the calibre of the trachea, but without making undue pressure, and having it freely movable on its shield, so that it shifts with the varying attitudes of the child. The tube should be carefully watched and the trachea daily examined for indications of irritation, and if detected, the tube must be removed and the opening in the trachea kept open by means of silver or hard-rubber or gutta-percha hooks, which are held in place by a tape going around the neck.

Tracheotomy, then, perfectly accomplishes its primary object—that is, to overcome a positive mechanical obstruction in the larynx, and to prevent that mode of death by which nearly all fatal cases of diphtheritic croup, in which it is not resorted to, terminate, namely, death by asphyxia.

We will now consider

The influence of the operation on the original disease.—Sir James Paget† says: "I have never seen the wound become diphtheritic after tracheotomy." Further he says‡: "I have collected the particulars of upwards of one hundred and twenty cases in which tracheotomy was performed in children suffering with diphtheria, and in none of them was the wound attacked by the disease."

Mr. Spence, in a letter to Sir James Paget, wrote: "I have on several occasions, seen the wound affected, and have known the child die from that, after the breathing was free and the tube removed." He does not in this communication state, however, whether or not the disease had disappeared from the fauces; in other words, that death was not due to the persistence of the original disease, at its original site.

Mr. Parker, of London, says: "In my own practice it has only occurred twice, and on each occasion it was very slight. In one case, on removing the tube, I found the wound patched over with little islands of false membrane. . . . In another case a similar condition of the wound was found."

* Mr. Durham introduced the right-angled canula in 1868.

† Second edition of his Clinical Lectures, p. 24. ‡ Op. cit., p. 463.

Mr. Howard Marsh says: "Diphtheria of the wound is rare."

Trousseau says he has seen leech-bites, slight cuts, blisters, and excoriations and different wounds in various parts of the body become diphtheritic, but he does not speak of its occurrence on the tracheal wound, which, from his usual careful minute way he surely would have done had he ever observed it.

Sanné,* who was a pupil of Trousseau, and who bases his observations on six hundred and sixty-two operations on croup by tracheotomy, says in his excellent work: "Diphtheria of the wound is not so frequent as you might at first suppose. It seems that the false membrane appears more readily on the cutaneous ulcerated surface, or that only deprived of its epidermis, than in a wound which involves the profound parts. This is so commonly the case that in diphtheria of the wound the lesion is first to be seen on the superficial parts, or edges of the wound, where the skin has been cut. It then extends to the neighboring parts." . . . "I will not advance, however, that diphtheria never attacks the edges of the wound, . . . but I do insist on this point, that very often the pellicles of the wound have been confounded with plastic exudations." . . . "Diphtheria of the wound by itself is not very grave; of all the complications which belong to the wound it is the most natural, since it is but the propagation to the exterior of the lesion which characterizes anatomically the malady; it has then in a great many cases but a local importance."

I had expected in examining the German authorities to find frequent mention made of diphtheria of the wound, on account of their proneness to call every wound on which there is an exudation diphtheritic. I find, however, that their references to it are very infrequent, that it is always found to be very slight, and does not complicate the original disease or the operation, and that it is readily controlled by simple treatment.

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* Étude sur le Croup après la Trachéotomie, par le Dr. Sanné. Paris, 1869.

Dr. O. Pinner, * in a report of one hundred and thirty-seven cases of diphtheria and tracheotomy says: "In a few cases diphtheria of the wound occurred."

Dr. Max Schüller † says in his work: "As a rule diphtheria of the wound may be prevented entirely by the early employment of damp carbolic dressings." . . . "At any rate it seldom becomes necessary to employ energetic remedies, as diphtheria of the tracheal wound does well under carbolic treatment."

Dr. H. Lindner ‡ says: "Diphtheria of the wound occurred in but three of one hundred and one cases operated on. Gauze compresses of carbolic acid was the only measure taken to prevent its occurrence."

We now come to

The influence of the operation on the cure of croup.—The admission of air into the lungs through an artificial opening in the windpipe secures for the diseased larynx entire rest, and this leads to a suspension of diseased action there. Even if the patient die after the operation, and we find, *post-mortem*, that the diseased action has not ceased in the larynx, it is generally either because the operation has been too long delayed, and, as a result, death followed too soon for any reparative process to take place, or to the character of the original disease.

Mr. Spence's communication to Sir James Paget shows that the cure of croup may be accomplished by tracheotomy during the persistence of the original disease, and which afterward may destroy life.

The following cases from Sanné's interesting work are most instructive, and confirm the statement that tracheotomy tends to the cure of this very fatal complication:

CASE IX., page 202.—Aged four years; operated on in second stage of croup. Died third day from exhaustion.

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* Deutsche Zeitschrift für Chirurg., B. xiv., p. 304.

† Deutsche Chirurg.; Prof. Dr. Billroth und Prof. Dr. Leucke, L. 37. Dr. Max Schüller; Die Tracheotomie, etc., p. 96. Stuttgart, 1880.

‡ Deut. Zeit. für Chir., November 8, 1882, p. 453.

Autopsy showed that the larynx contained no false membrane.

CASE XI., page 208.—Aged five years; operated on in third period. Died sixteenth day. Larynx swollen and œdematous, but contained no false membrane. Died of Bright's and pulmonary complications.

CASE XII., page 213.—Aged eighteen months: operated on in third period. Died fourth day. No false membrane in the larynx. Bronchi contained a quantity of detritus and false membrane. Marked congestion of posterior part of the lungs.

CASE XIII., page 214.—Aged five years. Tracheotomy third period. Died eleventh day. No false membrane in larynx; right lung healthy; left lung seat of pneumonia.

CASE XXVII., page 252.—Aged twenty-three months; operated on in *extremis*. Death eleventh day after operation. No false membrane in larynx.

CASE XXVIII., page 256.—Aged two years; operated second stage of croup. Died one hundred and fifty-fourth day. Nothing in larynx.

In every recorded case in which death occurred within twenty-four or forty-eight hours after the operation, false membrane was found in the larynx on autopsy.

In "Guy's Hospital Reports," Third Series, volume xxii., the autopsies in cases of croup show the same results as those given above.

Some interesting cases bearing on this are found in *The Medical Times and Gazette*,* in an article entitled "Comments on Tracheotomy for Scald of the Glottis." There were three cases which ended in recovery. The ages of the patients were one year, two and a half years, and three years, respectively. "It would appear that when cases do well after tracheotomy for this accident, that the restoration of a healthy condition of the laryngeal mucous membrane is rapid. In one case the canula was kept in place for six days, in another for five, and in a third for three."

* October 22, 1859, page 404.

The following case from "Guy's Hospital Reports,"* with remarks by Mr. Howse, shows still more strongly the value of tracheotomy in the cure of laryngeal disease: A child aged twenty-six months, with chronic laryngitis. Breathing stridulous. Tracheotomy performed by the house surgeon October 8th, died on the night of the 12th. Autopsy showed the larynx and epiglottis to be normal in appearance.

Remarks by Mr. H. G. Howse, one of the editors of the "Reports:" "The normal appearance of the larynx is of great interest, as it tends to show that when the part is put in a state of perfect rest after a tracheotomy operation, all signs of inflammation may subside within five days—the period which elapsed between the operation and death."

The cure of many cases of ulceration of the larynx by tracheotomy, occurring in the course of pulmonary phthisis, and which return after the tracheal opening is allowed to close, but again subside when the functions of the organ are once more suspended, might be quoted if time and space permitted.

The influence of tracheotomy in arresting diseased action in the larynx, leads us quite naturally to contemplate the relation of laryngeal to laryngo-tracheal diphtheria. The diphtheritic process stops at the level of the vocal cords much more commonly than is generally supposed. That this is true of a large percentage of the cases is shown by some valuable autopsies recorded by Krönlein.* Of 200 autopsies reported by Kronlein, in 46 there was false membrane in the *larynx and trachea;* and there were 164 with membrane in the *larynx* and on the parts above, and *no membrane in the trachea.*

When the disease involves the trachea it is by *propagation from the larynx, and not by a simultaneous attack on the larynx, trachea, and bronchi. In many cases this extension downward may be prevented by early making a way for sub-laryngeal respiration, so that the inflamed larynx may be allowed to rest, and be saved from irritation by the passing breath, and thus cause the arrest of diseased action there.*

*Guy's Hospital Reports, 1875, vol. xx., pages 507-8.

If tracheotomy *per se* is not dangerous, if it meet the complication of obstruction of the glottis, and is promotive of the cure of this complication; if the specific disease is in no way aggravated by it, and very rarely indeed appear on the wound, it certainly brings with it no element of added danger.

Influence of delay. The next consideration in deciding when to operate would be the result to the patient of delay in the performance of the operation. When we see that medicinal remedies fail to influence the arrest of croup, to relieve, or even to alleviate its symptoms, shall we trust to the occurrence of that rare accident, the expulsion of the membrane, or shall we operate without delay?

As to expectoration of the membrane and cure of the disease without operation, Dr. J. Lewis Smith stated at the April meeting that about one in eight recovered when medicinal treatment only was used. Upward of four hundred cases of diphtheria have been admitted to the Boston City Hospital during the past eight years. Forty of these patients suffered from diphtheritic croup, and every one died. *Not a single case of pseudo-membranous laryngitis has ever recovered in this hospital without an operation.** Statistics of croup (membranous), taken collectively, show that the disease is fatal in about ninety per cent. of the total cases.

After tracheotomy the recoveries are from one-third to one-half. Trousseu gives one-third in hospital, and one-half in private practice. During the past twenty years, one-third of the cases operated on in the Boston City Hospital have recovered.† Collected statistics from English and Scotch hospitals and private practice show that two-fifths recover after the operation.‡ Sanné § gives 89 operations by eleven operators in France, with 39 cures. In an-

*Krönlein in Langenbeck's Archives for Clinical Surgery, page 253. Berlin, 1877.

* Gay, Phila. Med. News, July 12, 1884, p. 33. † Ibid.

‡ Medical Times and Gazette, November 25, 1876, page 600.

§ Sanné: Diphtherie, page 467. Paris, 1877.

other table, 39 operations by five operators with 17 cures. Dr. Revilliod, Geneva, Switzerland, 87 operations with 38 cures. In all these the recoveries are more than two-fifths.* These figures at once decide clearly the only course to pursue.

Does delay in the performance of tracheotomy compromise its success? I cannot conceive a case where delay would be more dangerous; there is constant risk of suffocation, which sometimes comes on very suddenly. We gain nothing by delay, while the success of the operation is interfered with to a great extent.

When the rima glottidis is obstructed less air enters the lungs with every inspiration, and the lungs are less expanded; and in proportion as the circulation of air through these organs becomes diminished, the circulation of the blood will be embarrassed, and this soon causes this fluid to become vitiated by defective oxygenation. When the operation is long delayed the impeded state of respiration and circulation produce a violent constitutional disturbance; venous congestion has become general, the veins of the head and neck are turgid, the entire body cyanosed, cold, and bathed in clammy perspiration, the pulse at the wrist imperceptible, the face livid and ghastly, the child tossing in agony from one position to another, hoping to find relief, the inspiratory muscles, especially the auxiliaries, making violent but fruitless efforts to get more air through the contracted glottis. The vessels of the bronchial mucous membrane and the lungs become passively distended, and a little later serum infiltrates into the parenchyma of these organs, and the bronchi become choked up with mucus, thus impeding respiration still further. The weakened and overtaxed heart, with the brain, being supplied only with venous blood, the patient,—in fact, poisoned by his own vital fluid—becomes comatose or convulsed, and the sensorial functions blunted and nearly destroyed. Yet it is advised that the patient be allowed to reach this stage, that the immediate

* L'Union Médicale, 1876, third series, vol. xxii., p. 136.

precursors of death appear, before making an opening in the windpipe to allow the passage of air to the lungs! *

If under these circumstances the operation fails to save life, it is spoken of as being dangerous and perilous, of inducing secondary complications, and similar absurd expressions!

It would be as rational to persist with taxis in a strangulated hernia until gangrene has set in, before relieving the constriction with the knife, as to continue medicinal treatment in a case of obstruction of the glottis until the patient has arrived at the stage described, before making an opening for sublaryngeal respiration. And in the same proportion that delay in strangulated hernia is dangerous, so it is in a case of membranous obstruction of the glottis.

He who has made autopsies in cases of croup where tracheotomy has not been resorted to, and death has occurred from asphyxia, has seen that the lungs and bronchi are in a state of venous congestion.

My own records show this invariably. I have examined the records of a large number of autopsies and have found that, where carefully made and recorded, the appearances were quite uniformly the following:

First, where tracheotomy had not been performed, the lungs and bronchi were congested, and there was *always* an excessive quantity of mucus on the bronchial mucous membrane. In a smaller number of cases, œdema of the lungs and pneumonic changes.

Second, where tracheotomy had been performed in the third stage of croup, and death had followed soon after, the

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* Justice to my patient, justice to myself, fidelity to the profession I represent, all unite in demanding that *now*, early, before the development of conditions which will make any interference but a forlorn hope, tracheotomy should be done! (L. S. Pilcher, Proceedings Kings County Society, Brooklyn, May, 1877, p. 82.)

It will not be easy for you, gentlemen, to perform tracheotomy "too early" in the laryngeal affections of synanche, for it is doubtful whether the operation can ever be done too soon (Dr. H. Senator, German Clinical Lectures, Second Series, p. 452. New Sydenham Society).

post-mortem appearances were much the same as in the cases not operated on.

Third, where death had taken place from several days to two or three weeks after the operation, the mucous membrane of the bronchi and the pulmonary vessels were quite normal.

Showing how quickly obstruction to respiration may induce changes in the bronchi, Mr. Thomas Bryant * relates the case of a child three years old, in whom tracheotomy was performed for foreign body, and it could not be removed. The operation was performed one hour after the accident. The respiration remained unaltered, and nine hours after the operation, and ten after the accident, the child died. On autopsy, the bronchial tubes were found filled with tenacious mucus—in some parts completely obstructing the passage of air to the lungs, which were *airless*. A piece of nutshell was found in the rima between the cords.

The condition of the pulmonary and bronchial vessels, found so constantly after death from croup, results from obstruction in the larynx and impeded respiration, for when diphtheria exists in the throat only, and there is no implication of the larynx, the disease tends to destroy life by exhaustion and blood-poisoning, and rarely do any of the secondary bronchial or pulmonary complications occur.

Where these complications are found on post-mortem examination, after tracheotomy, they are not the result of the operation, for they seldom occur when tracheotomy has been performed on healthy organs, or in cases of syphilitic and even tubercular laryngeal disease, with chronic pulmonary disease, and the tube is worn for months, and in some instances for many years. The repeated performance of the operation on the same patient within a short period, without accident or complication, and with ultimate recovery, shows the utter harmlessness of tracheotomy, both in its immediate effects and in its remote consequences.

Mr. Greenfield † relates that tracheotomy on a child ten

* Guy's Hospital Reports, Third Series, 1860, vol. vi., p. 13.

† St. Thomas' Hospital Reports, vol. viii., p. 263.

months old, with croup, was repeated nine days after the first operation, and seven days after the removal of the tube by the nurse. During the latter part of this operation the child appeared to be dead. Artificial respiration was performed and the child revived. Recovery was perfect. Dr. H. Z. Gill * performed two operations of tracheotomy on a boy, aged three years and one month, with croup, at an interval of fifty-one days, with ultimate recovery. No bronchial or pulmonary complications after either operation. Pugin Thornton † performed tracheotomy four times in five years on a man sixty-seven years old, with syphilitic laryngitis, without accident or subsequent complication, and the case ended in complete recovery.

The great reason why bronchial and pulmonary complications follow tracheotomy where it is performed for croup is, that where obstruction has continued a long time the lungs are in a state of congestion, and in this condition any slight irritating cause, such as would act harmlessly on healthy lungs, will hasten on into a dangerous inflammation.

When it has been decided that a positive mechanical obstruction to the entrance of air into the lungs exists, do not wait until lividity sets in, before making a way for free and easy respiration. Let the operation be done before secondary complications have arisen, or the accession of those symptoms which are in themselves extremely dangerous to life, which often render all treatment unavailing, and make the removal of the mechanical obstruction of less importance.

While estimating the effect of protracted obstruction to respiration with the devitalizing influence on the blood of the rapidly accumulating carbonic acid gas, its depressing action on the organic nervous system and on the heart, we should keep in view that these combined influences are promotive of the spread of that depressing disease, diphtheria.

We must also take into consideration the life-giving and

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* Illinois State Medical Society Transactions, 1878, p. 167.

† British Medical Journal, February 17, 1877, p. 205.

disease-destroying power of oxygen. Oxygen is the most potent of all tonics, and pure, warm air is the most valuable remedial agent that we possess for diphtheria. Let a child with severe diphtheria be kept literally out of doors, in warm, dry, sunny, summer weather, and an almost immediate and uninterrupted improvement in all the symptoms will be observed, both in the general condition and in the local manifestations. In the majority of cases of croup the patient dies from want of oxygen and exhaustion of the organic nervous system; and the object of tracheotomy is to render oxygen accessible to the child; and it should be remembered that every draught of fresh air assists in the process of cure. Do not wait, therefore, until the patient's strength is worn out with gasping and fighting for breath before granting him nature's sovereign restorative.

Who can watch a child struggling for breath, with all the agony which in consequence ensues, without feeling impelled to have recourse without delay to the simple procedure of tracheotomy? Let those who council that tracheotomy be the last resort witness the extraordinary relief which follows it, how the breathing becomes tranquil, easy, and regular, the countenance natural, the cold sweat ceases, the pulse is again felt at the wrist, and perhaps the child sits up and takes nourishment, or falls into a quiet, peaceful sleep; and I think they will regret not having granted the child access to air sooner, and lifted in one instant an agony of suspense from the parents!

Guersant ascertained that the resolution of pneumonia is facilitated by the greater freedom with which the respiratory functions are accomplished after tracheotomy. But while the symptoms of suffocation and of pneumonic changes may be relieved by the late performance of tracheotomy, they may often be *prevented* by the early introduction of air into the lungs. It is said that if we advise early operation we may operate on many who would have recovered without recourse to this proceeding, and that we may see our patient recover after the operation has been rejected by the parents; but this will happen very rarely indeed, and it is better to

err on the safe side, as the operation can never increase the danger, while delay has many times deprived the patient of that chance of life which the operation can offer.

Though there are, undoubtedly, isolated cases of recovery from diphtheritic croup, the proportion of these is so small after we are *positive* that membranous exudation has invaded the larynx, that we ought to have early recourse to the only mode of arresting death in the majority of cases.

It is a far weightier responsibility to decide when to operate than merely to open the windpipe. We must first determine the existence of false membrane in the larynx, or that there is continued and increasing laryngeal stenosis.

Though recession of the soft parts of the chest-walls with every inspiration is a valuable test of the amount of interference with that act, it does not necessarily indicate the presence of a pseudo-membrane in the larynx, and it is not a reliable guide if the expiration is free and easy, for these symptoms may be due in great part to spasm. The dyspnœa due to spasm alone is intermittent or remittent, never continuous. But if there is suppression of the voice, and expiration is labored, prolonged, and audible, there is no longer doubt about the presence of membrane, for nothing but mechanical obstruction could produce these symptoms. As soon as they appear, and there are no longer *remissions* between the croupal paroxysms, but the dyspnœa is *continuous;* if insufflations of alum, or of alum and sulphur, with ipecacuanha, cease to afford relief, or emesis can no longer be produced, and if ipecac only purges, and poultices and steam have been fairly tried, it may be said that all remedial measures have failed to control the disease, and the operation should at once be performed.

There is nothing in the operation itself incompatible with recovery, even at the early age of six and nine weeks. In 1830, Dr. Scoutetten, Professor of Surgery, Military Hospital, Strasburg, operated successfully on his own child, six weeks old.

The diagnosis of croup in this case has been questioned,

but it is stated in the original report that there was expectoration of membrane for two days after the operation.

In 1880, Dr. Steinmeyer* performed a successful tracheotomy on a child nine weeks old. I have during this research found recorded† an astonishing number of recoveries from tracheotomy in infants from a few months to two years old, which shows that the tender age of the patient should not be allowed to contra-indicate tracheotomy; and the recollection of these may induce many to perform the operation who now oppose it on the ground of the early age at which we are frequently called upon to have recourse to it in many cases of diphtheritic croup.

In very young children the disease advances much more rapidly, and the liability to bronchial and pneumonic complications is greater, and they come on earlier in the disease than they do in older children, therefore we should operate earlier in the younger. In young children the trachea is deeply imbedded in cellular tissue and fat; it is small and freely movable, and the other structures of the neck are closely connected with it. Thus the operation presents *difficulties* which are not met with in older children.

Prognosis.—Early age, previous ill health, especially chronic catarrh, scrofula, bronchial and chronic pneumonic changes, all make the prognosis more serious. If scarlet fever or measles are prevailing at the time of the operation, and the patient has not had them, he contracts them with increased facility, and the prognosis is rendered very grave by this added danger. Nasal diphtheria makes the prognosis worse, and severe epistaxis before or after the operation is of bad prognostic omen. When croup comes on very early in the disease, and makes its appearance very suddenly, and the obstruction is at once extreme, the prognosis is far more serious, for in such a case the membranous exudation early tends to spread into the bronchi, and even to the alveoli. When the lymphatics of the neck are much enlarged, and the neck greatly swollen, the opera-

* Berlin. klinisch. Wochen., No. 46, 1880. Operation for retro-pharyngeal abscess.

† See table, p. 95.

tion has less chance of success. The presence in the urine of albumen and casts make the case more unfavorable. When the breathing is very laborious in character, and the supra-sternal, supra-clavicular, infra-clavicular, and the scrobiculus cordis depressions are not marked, the prognosis is less favorable than when recession at these places is very considerable.

When the bronchi and lungs are free, and the obstruction to inspiration is only in the larynx, the recession of the soft parts is very great. Less marked depression denotes obstruction below the larynx and the existence of secondary complications.

It is an unfavorable sign if the breathing does not become perfectly free and regular after the operation, and indicates either the existence of false membrane below the tracheal opening, or a large quantity of mucus in the tubes, or pneumonic changes. Difficulty in swallowing after the operation is a bad symptom. This arises from fluids passing through the glottis, where they excite convulsive coughing and escape through the canula.

After-management.—Success after tracheotomy is to be obtained more by careful nursing than from the perfection of the operation itself. From careful observation I am convinced that the two main causes of failure of tracheotomy in saving life are the late performance of the operation, and inefficient after-care, and among the last-named want of proper attention to the canula. Obstruction at the inner end of the tube, from false membrane or mucus, causes more deaths after tracheotomy, than either pulmonary diseases or the original malady which rendered the operation needful.* The physician should not forget that his whole duty is not performed when the operation is completed; that tracheotomy does not tend to *cure* the disease, but that it allows time for the application of the treatment found to be most successful in controlling it.

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*Seventy-eight per cent. die in the first four days (Wanscher.) Seventy-nine and one-half per cent. die in the first four days, and nearly sixty-three per cent. during the first two days (Krönlein, in Langenbeck's Archives.)

The sustaining of the patient, the administration of the remedies for the arrest of the disease, attention to measures for subduing the local process and reducing inflammation, the temperature, quality, and amount of moisture in the air that the patient breathes, the care of the canula, and the condition of the trachea and bronchi are not generally carried out with enough thoroughness to give the patient all the advantages which the operation is capable of affording.

I must again revert to the most important of all the questions just now in connection with our subject—the danger of the operation itself. The quotations from so many eminent authorities of vast experience in the performance of tracheotomy prove beyond all peradventure that the opinion that it is a dangerous operation is erroneous—and it is not only erroneous, but dangerous.

To the majority of people in this city the proposal of tracheotomy seems equivalent to pronouncing sentence of death; and from the operation being represented as formidable comes the unwillingness of parents to consent to it until the child is about to expire, and of physicians to undertake its performance.

In many cases where tracheotomy is required it is as much a case of emergency as that of a bleeding artery. When danger is imminent, an operation is often needed even without a consultation, and a delay of a few minutes might cost the life of the patient, but owing to the practitioner being afraid to operate, he often leaves his patient struggling for breath and rushes after a *tracheotomist*, and returns, perhaps, to find that his patient has died strangulated.

At the March meeting one of the speakers said that he had been summoned to half a dozen such cases, and then, in alluding to the danger of tracheotomy, he stated that he "was willing to go upon record as saying that there have been more deaths upon the table in tracheotomy than from any other operation which is performed." * From this he inferred its danger! It would have been as logical to have

* Dr. Ripley, Medical Record, April 5, 1884, p. 388.

said that tracheotomy is dangerous because more patients have died during the delay attendant on the bringing of a tracheotomist to the patient.

An eminent physician in the early part of this century was allowed to perish from this very neglect. Dr. Matthew Baillie, in the third volume of the "Transactions of the Society for the Improvement of Medical and Surgical Knowledge," records the fatal illness of Sir John Macnamara Hayes. He was taken ill on July 16, 1809. His disease was croup. On the night of the 18th tracheotomy was proposed. Mr. Home and Mr. Wilson were sent for to perform bronchotomy. Mr. Wilson was out of town, and Mr. Home did not come until four in the morning, but the patient was then in a dying state; he expired at six. Autopsy, 20th: "The cavity of the glottis was found to be almost obliterated by the thickening of the inner membrane of the larynx at that part."

A prominent practitioner in this city left a case of diphtheritic croup in the care of a young surgeon, who had been on the surgical staff of Bellevue Hospital for eighteen months, with the instruction that he should go for Dr. X. if he thought tracheotomy necessary. It did become so and he obeyed instructions. Dr. X. not being at home, another surgeon was sought and found. The trachea was opened immediately, but the child died soon after from exhaustion, owing to the late performance of the operation.

Contrast this absurd proceeding with the custom in the hospitals in England, where nearly all the tracheotomies are performed by the house-surgeons.

In this connection the action of Dr. J. G. Ehrhardt,* in the light of a single experience of the kind, is interesting and instructive: Case of diphtheritic croup, summoned at 2 P.M., December 12th, and found child much worse. Tracheotomy only thing that offered benefit. Time was lost while waiting for my father to assist me; when he arrived the boy was nearly dead. There were two or three respirations after

* American Journal of the Medical Sciences, April, 1873, p. 421.

the tube was inserted. I do not believe that the operation hastened death. December 15th, called to a boy of five years. Time was too precious to send for a surgical assistant; operated at once. Child recovered.

The physician who leaves his patient in a state of rapidly advancing asphyxia and goes in quest, perhaps in vain, of a surgeon merely to make an opening in the windpipe, is as culpable of neglect as he would be if he left a spurting artery and went for a surgeon to arrest the bleeding.

Another reason why an exaggeration of the danger of tracheotomy should not prevail is that in country districts it almost entirely prevents recourse to it. A physician but eighty miles from this city, who is in the habit of doing capital operations, has told me that he would not dare to undertake tracheotomy, because there is a *universal* impression that the operation is extremely dangerous to life.

I hope, as a result of the proper appreciation of this life-saving measure, and a thorough understanding of its harmlessness, that when diphtheritic croup is epidemic in the country, tracheotomy will be as frequently performed by the "family physician" as common bleeding used to be.

This misrepresentation of the danger of tracheotomy has caused its abandonment several times in its history. After its proving successful in the hands of Asclepiades, 100 B.C., from its being scorned and being spoken of as a crime by Cælius Aurelianus, it was lost sight of for more than two hundred years, when it was revived by Antyllus about 340 A.D. After this the writings of Rhazes, Avicenna, and others caused its suspension until the time of Paulis Ægeneta in the seventh century, who seems to have repeatedly opened the windpipe. From that date until the attempted reintroduction by Guieto de Cauliaco, in the fourteenth century, we hear nothing of the operation. During the first half of the sixteenth century Benivieni performed it successfully, and about the same time Saliceto and Rolandi. Brasavola, in the middle of the sixteenth century, asserts in his "Commentaries" that he himself opened the trachea* in

* 1546.

the case of a patient laboring under quinsy, and on the point of death, and thus saved his life, the surgeon not daring to perform the operation.

In 1730 Dr. George Martyn* performed tracheotomy on a young lad for croup, and "with such success that in less than four days, his breathing being perfectly easy, we removed the canula, and left the glottis to do its own office." He introduced the double canula.

Dr. Michaelis† in a letter from New York, dated 1780, advised early operation in these words: "It is unpardonable if it is not resorted to in time."

In 1807 Napoleon offered a prize for the best essay on diphtheria. The men between whom the prize was divided, and all who were gathered at the great medical concourse in Paris when it was awarded in 1808, were, with one exception, opposed to tracheotomy. Caron upheld the operation with great energy and indefatigable perseverance. So strong were his convictions, and so great his ardor, that he offered a prize of a thousand francs to the man who would cure croup with the aid of this operation. But the opinion of the judges and the writers of the prize essays so influenced men that there was no advance made in tracheotomy until Bretonneau. It was given to Bretonneau to restore a supreme resource so unjustly condemned. Four consecutive reverses did not discourage him, and in 1825 he had the happiness of saving the daughter of his best friend by the operation.

In 1814 Thomas Chevalier,‡ of London, made a successful tracheotomy in diphtheritic croup in a boy seven years old. Such, however, was the opposition to and dread of the operation, that § "in 1820 a medical gentleman of high standing in this city (Edinburgh) who was anxious to afford

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* Phil. Trans. for the year 1730, p. 438. London, 1809.

† Richter's Chirurg. Biblioth., vol. vi., p. 120. Voss: N. Y. Journ. Med., January, 1860, p. 31.

‡ Med. Chirurg. Trans., 1815, vol. vi., p. 150. This operation, though attributed to Mr. Chevalier, was done by Mr. Lightfoot, the house surgeon.

§ James Spence at the Forty-third meeting of the British Medical Association.

relief to two of his children affected by croup could not prevail upon any of the principal surgeons to perform tracheotomy. At his urgent request Dr. Bryce, a gentleman in general practice, operated on one of the children without ultimate success, as both of them died."

Though we need not apprehend the abandonment of the operation to-day, an exaggeration of its dangers might be the means of its being withheld from many who could be saved by it, or of its not being resorted to until it is too late to accomplish any good. Let not the erroneous and dangerous opinion go forth from this Academy that tracheotomy is the most dangerous of all surgical operations! The diffusion of this dictum emanating from such a representative body of medical men, will be the means of destroying far more lives in a comparatively short period, than the operation itself or anything directly connected with its performance has from the time that it was first instituted, more than two thousand years ago.

CONCLUSIONS.

Tracheotomy of itself, performed with care, involves little if any danger to life.

Accidents during the operation generally result from want of care.

It prevents asphyxia, and thus gives more time for the administration of remedies, and for the system ultimately to throw off the disease.

It prevents laborious and rapid breathing and lessens exhaustion.

It allows a free supply of air, and thus assists in the cure of the original malady.

It is the supreme resource, and as the patient cannot be made worse by it, do not postpone it until there is but a forlorn hope even from it.

Persistence of the original disease, delay in the performance of the operation, and neglect after, are the chief causes of its failure.

Operate early, very slowly, deliberately, and carefully.

It is never too late to operate: even though the child has stopped breathing, if life is not extinct, open the windpipe and perform artificial respiration—many children have been saved under just such conditions.

If strangulation is the main symptom, neither age, constitutional condition nor complications can furnish a contra-indication to its performance.

It alleviates suffering.

It mitigates all the symptoms.

It obviates secondary complications.

It never adds one element of danger to the original disease.

Statistics taken collectively show that nine-tenths of the cases which render the operation needful will suffocate without it.

Performed early it snatches from certain death fully two-fifths of all the cases.

No patient that dies after the operation would have lived if it had not been performed.

When it fails to save life, the relief afforded and the substitution for the most agonizing mode of death—strangulation—one of the least, by asthenia, are sufficient reasons to justify its performance.

The dictates of science, facts, and common humanity, unite in demanding it.

Severinus must have been inspired when in the seventeenth century he said of it: "It is a divine invention."

Allow me one more quotation, gentlemen. In The Medical Record of June 28, 1884, Professor Letamendi says: "In the days of more knowledge and less nonsense, tracheotomy will be ranked among the minor surgical operations."

SUCCESSFUL TRACHEOTOMIES FOR CROUP IN CHILDREN ONE YEAR OF AGE AND UNDER.

Case.	Age.	Disease.	Operator.	Authority.
	Mos.			
1	1½	Croup.	Scoutetten (1830).	Soc. Med. des Hôp. de Paris, 1867.
2	3	Croup.	Annandale.*	Ed. Med. Jour., vol. vii., part 2, June, 1862, p. 1121.
3	6	Croup.	Küster.	Elias, Deutsche Med. Wochen., Nov. 9, 1878, p. 555.
4	6½	Croup.	Jos. Bell.	Bell, Letter to Brit. Med. Jour., April 8, 1871.
5	7	Croup.	Tait.	Brit. Med. Jour., April 15, 1871, p. 391.
6	7	Croup.	Lindner.	Deutsche Zeitschrift f. Chir., Band xvii., Heft 5 und 6.
7	7	Croup.		
8	7	Croup.	Wegner.	Krönlein, Archiv f. klin. Chir., vol. xxi., 1877, p. 266.
9	7	Croup.	Krönlein.	Rauchfuss, in Gerhardt's Handb. Kind., vol. iii., p. 202.
10	7	Croup.	——————†	Elias, op. cit. from St. Petersburg Med. Zeitung, 1877.
11	7½	Croup.	Jos. Bell.‡	Syme, Ed. Med. Jour., vol. vi., part 2, April, 1861, p. 956.
12	8⅔	Croup.	Elias.	Deutsche Med. Wochen., Nov. 9, 1878.
13	10	Croup.	Day.	Greenfield, in St. Thomas' Hosp. Rep., vol. viii., p. 263.
14	10	Croup.	Baizeau.§	Gaz. des Hôpitaux, 1867, p. 397.
15	10	Croup.	V. Winiwarter.‖	Jahrbuch f. Kind., 3 u. 4, p. 337, 1876.
16	10	Diphtheria	Elias.	Deutsche Med. Woch., Nov. 9, 1878.
17	10	Croup.	Bourdillat.	L'Union Méd., 1872, vol. xiii., 3d series, p. 826.
18	11	Croup.	Geo. F. Shrady.¶	N. Y. Med. Record, vol. xxii., Nov. 4, 1882, p. 512.
19	11	Croup.	Trousseau.	Paris Thèses, 1834, t. cclxxviii., No. 289, p. 13, Aussandon's Thesis.
20	11	Croup.	Rauchfuss.	Gerhardt's Handb. Kind., vol. iii., p. 202.
21	11	Croup.	J. Cooper Forster.	Brit. Med. Jour., March 25, 1871, p. 309.
22	11	Croup.	Derby.	Stevens, Boston Med. and Surg. Jour., vol. lxxi., October, 1869, p. 167.
23	12	Croup.	Lindner.	Deutsche Zeit. f. Chir., Band xvii., Heft 5 u. 6.

* Child lived seven weeks after the operation. On autopsy lungs were found to be perfectly healthy.

† Name not given.

‡ Communication to Medical Chirurg. Society, Edinburgh. Professor Syme thought that the operation would not do any good in this case, but yielded to Bell, the house-surgeon, who did the tracheotomy, which was followed by instant relief to the child.

§ Twelve children under two years operated on, four got well.

‖ Respiration stopped and artificial respiration was performed for ten minutes, and had to be resorted to three times within the first hour.

¶ This is the youngest successful case operated upon in this country. This operation was performed between the tenth and eleventh month. Child is still living.

Case.	Age.	Disease.	Operator.	Authority.
	Mos.			
24	12	Croup.	Trendelenburg.	Gerhardt's Hand. Kind., vol. vi., p. 262.
25	12	Croup.	A. T. Woodward.	Mastin, Gaillard's Med. Jour., January, 1880, p. 30.
26	12	Croup.	Dujardin.	L'Union Méd., 1872, 3d series, vol. xiv. [p. 46.
		FROM ONE TO TWO YEARS OF AGE.		
27	13	Croup.	Wardner.	Gill, Ill. State Med. Soc. Trans., 1878, p. 164. Mastin, Gaillard's Jour., January, 1880, (p. 30.
28	13	Croup.	Barthez.	Gaz. Hebdom., 1862, p. 806.
29	13	Croup.	Trousseau.*	Jour. des Conn. Med. Chirurg., Sept. 3d, 1834, t. ii., p. 1.
30	13	Croup.	Archambault.	Gaz. des Hôpitaux, 1867, p. 307.
31	13	Diphtheria	Steavenson.†	St. Barthol. Hosp. Reports, vol. xviii., 1882, p. 313.
32	14	Croup.	Cabot.‡	Haywood, Boston Med. and Surg. Jour., vol. lxii., p. 273, 1860.
33	14	Croup.	V. Langenbeck.	Krönlein, Archiv f. klin. Chir., vol. xxi., 1877, p. 268.
34	14	Croup.	Rapin.	Sanné, Traité de la Diphthérie, p. 481, Paris, 1877.
35	14½	Croup.	Millard et Hémey.	Sanné, Op. cit., p. 481, Jour. de Therapeutique, 1874. [p. 61.
36	15	Croup.	Cabot.	Boston Med. and Surg. Jour., vol. lxx.,
37	15	Croup.	Hélie.	Gaz. des Hôpitaux, 1867, p. 397.
38	15	Croup.	Baizeau.	Gaz. des Hôpitaux, p. 397, 1867.
39	16	Croup.	Isambert.	Gaz. des Hôpitaux, 1867, p. 307.
40	16	Croup.	Lindner.	Deutsche Zeit. f. Chir., Band xvii., Heft 5 u. 6. [1877.
41	16	Croup.	Wegner.	Krönlein, Archiv f. klin. Chir., vol. xxi.,
42	17	Croup.	Nathan Jacobson.	N.Y. Med. Record, June 30, 1883, p. 705.
43	17	Croup.	Vigla.	Gaz. des Hôpitaux, 1867, p. 307.
44	18	Diphtheria	Bartscher.	Deutsche Med. Wochen., 1880, p. 29.
45	18	Croup.	C. Withusen§	Dub. Med. Press, April 5, 1865, p. 320, from Ugeskrift for Larger, March 16, 1865. [pp. 105–6.
46	18	Croup.		
47	18	Croup.		
48	18	Diphtheria	Josef Pauley.	Berlin. klin. Wochen., Feb. 25, 1878,
49	18	Croup.	George Rachel.	Amer. Jour. Med. Sci., July, 1877, p. 95.
50	18	Croup.	Collins.	Mastin, Gaillard's Med. Jour., vol. xxix., p 30, Jan., 1880.
51	18	Diphtheria	Voigt.	Jahrbuch f. Kind., vol. viii., p. 121, 1882.
52	18	Croup.	Moutard-Martin.	Gaz. des Hôp., 1867, p. 308.
53	18	Croup.	Potain.	Gaz. des Hôp., 1867, p. 308.
54	18	Croup.	Archambault.	Gaz. des Hôp., 1867, p. 307.
55	19	Croup.	Roger.	Gaz. des Hôp., 1867, p. 308. [1849.
56	19	Croup.	Pancoast.	Meigs, Amer. Jour. Med. Sciences, April,
57	19	Croup.	Bose.	Krönlein, Op. cit.
58	19	Croup.	Weber.	Zeitschrift f. Ration. Med. Neue Folge 1, Band iii., Heft 1, p. 8, 1852.

* Operation same year as reported.

† Child had scarlet fever and recovered.

‡ Child had double pneumonia and recovered.

§ One case died on eighty-first day of exhaustion from tubercular diarrhœa.

Case.	Age.	Disease.	Operator.	Authority.
	Mos.			
59	19	Croup.	Wegner.	Krönlein, Op. cit. [1872, p. 163.
60	19	Croup.	Trendelenburg.	Vaneschi, Berliner klin. Woch., April,
61	19	Croup.	Jennings.	Archives of Pediatrics, vol. i., No. 9, Sept. 15, 1884, p. 546. [1872, p. 163.
62	20	Croup.	Busch.	Vaneschi, Berliner klin. Woch., April,
63	20	Croup.	Bose.	*Ibid.* [223.
64	20	Croup.	Fitzau.	Berliner klin. Woch., April 25, 1879, p.
65	21	Croup.	Krönlein.	Krönlein, Op. cit. [p. 71.
66	21	Croup.	T. Sendler.	Vierteljahrschrift f. Prak. Heil., vol. iv.,
67	21	Diphtheria.	House Surgeon.*	Poland, Brit. Med. Jour., Sept. 16, 1882,
68	22	Croup.	Dower.	p. 523.
69	22	Croup.		Brandt, N. Y. Med. Record, Jan. 13,
70	22	Croup.	Isambert.	1883, p. 54.
71	22	Croup.	Cushing.	Sanné, Diph., p. 481. [p. 14.
72	22	Croup.	Laborde.	Pacific Med. and Surg. Jour., vol. vii.,
73	22	Croup.	Maslieurat - Lagèmard.	Gaz. Hebdom., 1862, p. 807. [p. 170. Gaz. Méd. de Paris, 1841, p. 380; 1842,
74	22	Croup.	Ferraux.	Gaz. Hebdom., 1862, p. 807.
75	22	Croup.	Johnson.	Ill. State Med. Soc. Trans., 1879, p. 120; reported by Gill.
76	22	Croup.	Wegner.	Krönlein, Op. cit.
77	22	Diphtheria.	Mayer.	N.Y. Med. Record, Apr. 26, 1884, p. 457.
78	22	Diphtheria.	Parker.	Steavenson, St. Barthol. Hosp. Reports, vol. xviii., 1882, p. 323.
79	23	Croup.	Laborde.	Gaz. Hebdom., 1862, p. 807.
80	23	Croup.	Trousseau.	Sanné, Diph., p. 481.
81	23	Croup.	Bose.	Krönlein, Op. cit.
82	23	Croup.	Burland.	Gaz. Hebdom., 1862, p. 808.
83	1–2	Croup.	Krackowizer.	Jacobi, Am. Jour. Ob., May, 1868.

CASES EXACT AGES NOT GIVEN.

84, 85, 86	1–2	Croup.	Körte (3 cases).	Arch. f. klin. Chir., Band xxv., p. 820.
87 to 93	1–2	Croup.	Revilliod (6 cases)†	L'Union Méd., 3d series, t. xxii., 1876, p. 136.

*Name not given.

†Of sixteen children operated upon under two years of age, he obtained six cures, that is to say, 37.5 per cent. The youngest of his cases was fifteen months, the oldest twenty-three months.

DISEASE OF THE FALLOPIAN TUBES, AND HISTORIES OF FOURTEEN CASES OPERATED UPON AND REPORTS ON SPECIMENS.*

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In looking up the literature of salpingitis, minute descriptions of the pathological anatomy will be found in the writings of Kiwisch, Förster, Rokitansky, and later Martin Klob, Schroder, Henning, and other German writers; but little advance was made in the treatment until a few years ago, when Mr. Lawson Tait made known his wonderful success in removing diseased tubes. The writings of Battey and Hegar on removal of ovaries also had an influence in developing the proper plan of treating diseases of the uterine appendages.†

Dr. J. Marion Sims, for several years before his death, was much interested in the subject, and, as his assistant, I helped him in a number of cases. But it was not until I was appointed one of the gynecologists to Bellevue Hospital and began my clinics at the New York Polyclinic, in 1882, that

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* Read before the New York Academy of Medicine, January 15, 1885.

† The author does not desire to discuss the claims of Tait, Battey, and Hegar, but there can be little question that, among the English-speaking profession, Battey first made plain that we should operate upon certain forms of ovarian trouble besides ovarian tumors, and Lawson Tait first taught us that we should and could remove diseased Fallopian tubes in many cases. Hegar may have done the same thing in Germany.

I had an opportunity to study clinically a large number of cases. Since then I have made a careful study of the subject, and since May, 1883, when I did my first operation for removal of diseased tubes, I have operated upon fourteen cases for diseased uterine appendages, not including operations for ovarian or uterine tumors. Each of the fourteen cases were under my observation and treatment several weeks before the operation, and many had been kept in my ward at Bellevue three, six, and one or two even nine months beforehand. By a careful study of each case and by the use of preparatory treatment to soften and relax the adhesions, I was able, in almost every case, to make a more or less exact diagnosis before operating. Of these, nine were operated upon in either the Sturges or the Marquand pavilion at Bellevue Hospital, the remaining five were in private practice. Twelve recovered and two died of septicæmia on the fifth day; the latter were hospital cases. Eight were cases of pyo-salpinx; two hydro-salpinx, and four catarrhal tubes with peritoneal adhesions. With one or two exceptions, there were extensive adhesions from local peritonitis and the ovaries were either diseased or more or less covered with adhesions, and, in three instances, abscesses were found involving the extremities of the tubes and the ovaries. Short histories of each case were read, and twelve of the fourteen specimens, with a report on the specimens by Dr. H. C. Coe, Pathologist to the Woman's Hospital of the State of New York, were shown last night at the New York Pathological Society. Many other cases were kept under observation and clearly diagnosed, but either because the patients objected to the operation, or the subjective symptoms did not justify it, they were not operated upon.

I am satisfied that a careful study of the diseases of the Fallopian tubes will not only clear up most of those numerous and once incurable cases of local peritonitis (in this country commonly called cellulitis), but also most of the cases of retroversion, retroflexion, and lateral flexions with adhesions, and that their proper treatment will make plain the uselessness and danger of using pessaries in such cases. I

do not mean to say that every case of local peritonitis will be found due to salpingitis, but that, in the large majority of cases salpingitis precedes the local peritonitis, and that repeated attacks of local peritonitis are, as a rule, caused by salpingitis.

In my opinion when the frequency and the great importance of diseases of the Fallopian tubes is generally understood, the fascinating teaching of the mechanical pathologist, namely, that most of the ills of women are due to uterine displacements, that the real disease is the version or flexion, and when this is corrected and the uterus is held by a pessary in an ideal normal position that all will be well, will fade to small proportions and the relatively few lines now to be found in our text-books on salpingitis will increase rapidly, and there will not be so many hundred pages on cellulitis, displacements, and pessaries.

Etiology.—Anything which causes endometritis may induce disease of the Fallopian tubes, and it is probable that in most cases salpingitis is due to an extension of disease from the lining membrane of the uterus directly to that of the tubes. In virgins it is comparatively rare, except from catarrhal disease. In imperfectly developed and delicate girls and women, the degenerate state of the mucous lining makes it an easy prey to catarrhal disease, and an endometritis may be extended to the tubes. Tubercular disease may also attack the Fallopian tubes.

Many of the profession, especially those who treat genito-urinary disease in the male, look upon gonorrhœa in women as a very trivial disease, probably because it does not produce urethral strictures. When Dr. Noeggerath read a paper on this subject before the American Gynecological Society, in 1876, his views on gonorrhœa may have been extreme, but on salpingitis they were well in advance of the general knowledge on this subject at that time, and now, if the gonococci causes the disease and he can find the gonococci in all, or in most of his cases of latent gonorrhœa, his theory will be proven to be true. There is no doubt but that gonorrhœa is a very frequent and in many instances an

unsuspected cause of salpingitis. Among prostitutes this disease and septic endometritis following abortions, by causing salpingitis, accounts for the incurable sterility so universal among this class, even though they return to the paths of virtue. Early in its course, before the poison has reached the deep-seated glands of the vagina, or the lining membrane of the uterus, it may be checked in its course by repeated applications of a solution of a mercuric bichloride or some other antiseptic, but when once it enters the uterus it cannot safely be treated locally until it has become subacute, for any attempt to introduce even a small probe may cause uterine contractions and pains which are pretty certain to be followed by local peritonitis within the next twenty-four hours, and the probability is, that this is caused by the tube becoming infected by the contractions forcing the poison in from the uterus. Even when treated with the greatest care, specific endometritis will in many instances cause salpingitis and local peritonitis. I have selected several well-marked cases and put them to bed, and watched the course of the disease from the vagina to the uterus, from the uterus to the tube and peritoneum. Salpingitis from gonorrhœa may result in active pyo-salpinx with a thick yellowish or greenish pus, or it may become chronic and the discharge gleety and thin in character. The tubes may close at the fimbriated extremity, and after the first attack of local peritonitis drain into the uterus, but frequently after a time the tube becomes distended on account of a stricture of the proximal end, and the patient may have repeated attacks of local peritonitis, indicating that the adhesions which nearly always seal up the fimbriated extremity have yielded or the poison in some way has reached the surrounding tissues.

Syphilis may cause salpingitis, just as it does otitis or ozæna. Some of the most obstinate cases of endometritis that I have ever seen have been in syphilitic subjects.

Septic poisonings after labor and abortions, especially after the latter, is a frequent cause of salpingitis. After abortions the cervix uteri is not so patulous as after full term labor, the cervix being more irritable and likely to con-

tract and obstruct drainage, and any effete matter may be not only retained in the cavity of the uterus, but when the uterus contracts it may be forced into the Fallopian tubes.

It may be a disease that induces the abortion, and this extends to the tubes. Besides, after an abortion, neither the patient nor the doctor are likely to keep up the usual precautions and give time for involution to take place. Sub-involution and endometritis are much more common after abortions than after normal labor. It is my opinion that in most instances it is through the tubes that septic poison causes local peritonitis. Septic material is, of course, often absorbed directly from the uterine tissues by the blood-vessels and lymphatics, but the poison is carried into the circulation, and does not directly enter the peritoneal cavity. Local peritonitis is much more common on the posterior surface of the broad ligament than on the anterior surface, for the tube opens on the posterior surface of the broad ligament. My experience leads me to attach much more importance to local peritonitis than local cellulitis, for, except after septicæmia, where the poison has become localized in the cellular tissue, producing a phlegmon, the cellular tissue is, as a rule, merely affected by contiguity with the inflamed peritoneal tissue, and I do not believe in so-called "chronic cellulitus." Hydro-salpinx may be due to other causes than venereal or catarrhal disease, but in what way it has not been made clear to me, although I must admit that I have seen some cases not satisfactorily explained by saying that it is the sequel of catarrhal disease or subacute inflammation. Small thin cysts may be found on the outside of the tube, but these more properly belong to the broad ligament. Diseased tubes are very commonly associated with diseased ovaries, and I think in most instances the disease of the tubes precedes that of the ovaries, and the diseased ovaries are but the result of an extension of the disease from the tubes to the ovaries and peritoneum. But certain diseases of the ovaries may cause disease of the tubes, such as cancer.

In several cases I have found cystic disease of the ovaries

associated with catarrhal disease of the tubes, and it is this combination which I have noticed in the worst cases of hystero-epilepsy. In fact, if I have a well-marked case of hystero-epilepsy or hysterical patient to operate upon, I expect to find cystic or atrophied ovaries with catarrhal disease of the tubes.

Hemorrhages into the tube may result in more or less permanent distention, and anything which stops up or diminishes the size of the lumen of the tube may obstruct drainage and result in disease and distention.

Symptoms and diagnosis.—The subjective symptoms are very variable. A peculiar burning pain over the seat of the tube affected is, perhaps, more characteristic than any other symptom, but many patients have no such pain, and local sensitiveness and a dull pain over the tubes and ovaries is about the only constant symptom; sometimes a dragging pain or sensation will be present when the patient stands, or there will be backache and headache, such as is supposed to be due to displacement, which are so commonly associated with, and are often due to the diseased tubes.

Dysmenorrhœa is a common symptom in these cases, but in some the flow gives relief by lessening the congestion, and I am inclined to believe that the pain is often caused by the endometritis, or the result of the endometritis in producing contraction and hyperæsthesia of the mucous membrane, for in those cases where all stenosis and endometritis is cured by treatment, as a rule, the dysmenorrhœa disappears. Menorrhagia or metrorhagia is often associated with salpingitis, but I think it will most frequently be found to be due to vascular changes in the lining membrane of the uterus, and a thorough curetting with a good instrument may effect a cure, although great care must be exercised in preparing the case for operation lest the salpingitis be so disturbed as to start up peritonitis.

Sterility is the rule in salpingitis, and when both tubes are affected, which is usually the case, it is incurable, but when only one side is affected and the proximal end of the tube of the diseased side is closed, pregnancy is possible and may

go to full term, but as the uterus enlarges there may be severe local pain, and abortion is likely to occur.

Perhaps the most reliable indication of severe salpingitis is the occurrence of repeated attacks of local peritonitis, or active pelvic congestion without other evident good reasons for such attacks. Wet feet and exposure to cold may be an exciting cause and induce a catarrhal attack, and thus bring on endometritis, etc., but when exposure is followed by peritonitis, I would always look for a latent salpingitis or some such real cause.

Objective symptoms.—In acute cases there is usually so much swelling and tenderness that about all we can make out is a fulness or thickening of one or both broad ligaments, associated with more or less fixation of the uterus. Take such a case and keep her in bed until the painful symptoms completely subside. Then place thin pledgets of cotton saturated in pure glycerine against the cervex uteri two or three times a week, and, as the case becomes subacute, add alum to the glycerine and continue the pledgets for from three to eight weeks, and the inflammatory products will be so much absorbed or stretched that the uterus will become moveable, and an expert may be able to define an enlarged tube or a mass that he can make out to contain a diseased tube or ovary more or less prolapsed and adherent in one or both broad ligaments. In subacute cases a diagnosis may be more easily made, but often a doubtful case can be cleared up by the same treatment recommended for acute cases. A diagnosis is especially easy when only one side is affected and the uterus is not retroverted. By the prolonged use of pledgets of cotton, soaked in a mixture of alum and glycerine, a distended tube can be readily defined by bimanual examination. Of course much will depend upon the thinness and laxity of the abdominal walls, and now and then a case will be found that, to get a clear diagnosis, it is necessary to examine the patient under ether. In some cases the floor of the pelvis is so fixed by adhesions and there is so much venous congestion or enlargement of the pampiniform plexus, especially of the left side, that a

certain diagnosis cannot be made; a prolapsus of, or adhesions to the sigmoid flexure, may complicate and make a diagnosis more difficult. In some cases of catarrhal tubes they are not distended, but feel like a thin band of adhesions. The ovaries are apt to be more or less cystic, or are often infiltrated and enlarged by inflammatory products, and are nearly always prolapsed with and folded under the tubes on either side.

Sometimes, when the proximal end of the tube is patulous, the discharge will enter the uterus, and I have seen one or two cases where, from an accurate knowledge of the state of the uterus and vagina, it could be made plain that the gleety discharge has come from the distended tube; after cleaning the vagina and uterus, fresh pus could be made to appear in the vagina by slowly pressing upon the distended tube. The fluid may escape intermittently into the uterus, and, if irritating, may set up each time an acute endometritis. Now and then a tube distended with fluid will empty a large amount of fluid into the uterus at once, which, for the time, flows freely from the vagina, and the tube will refill and again discharge.

Pathology.—In the literature of salpingitis comparatively little is to be found in English on the subject, and until very recently it was hardly mentioned in our text-books. We are compelled to go to German writers, where, as before mentioned, we will find full and accurate accounts of the pathology. I will not attempt here to give the microscopical appearances, but to bring out more especially what may be called the surgical pathology. As has been before stated, salpingitis is nearly always caused by the extension of disease from the endometrium to the lining membrane of the tubes. Now, aside from the different character of the mucous membrane of the uterus from that lining the tube, the different shape, size, and position of the tubes from that of the uterus also makes a marked change in the results of the same disease.

Inflammation of the endometrium causing enlargement of the uterus may result in displacement, imperfect drainage

and parametritis, but this is not the rule; besides, the uterus is accessible and directly amenable to local treatment, while inflammation of the lining membrane of the tube which causes swelling is almost certain to result in prolapse of the tube and obstruction of the naturally small lumen, and thus cause imperfect drainage, and almost always induces peri-salpingitis on account of the open extremity emptying its contents into the peritoneal cavity. The tube cannot be directly treated; the lumen cannot be dilated, and perfect drainage secured as in endometritis. Hence salpingitis nearly always becomes chronic, in many instances lasting as long as the patient.

The first effect of disease reaching a tube, is to cause it to become engorged with blood; as it is loosely attached to the upper border of the broad ligament, it sinks lower in the pelvis covering or folding over the ovary, and as the beginning of salpingitis, after labor or an abortion, is so often associated with an enlarged uterus, this organ sinks lower, and as the patient during the acute stage is, as a rule, on her back, the fundus inclines backward. Now, suppose the uterus is enlarged, lying backward, and the disease affecting the uterus extends to the tubes, they swell, sag backward and downward, covering the ovaries, and as soon as the discharge of the disease reaches the peritoneum through the open end of the tube the peritoneum becomes inflamed, lymph is thrown out, gluing the different organs together. As the acute stage subsides, the lymph contracts, bands of adhesion draw and distort the organs, and the folded, twisted, and adherent broad ligament holds the uterus in its backward displacement. As a rule, the peritoneal tissue covering the fundus is not adherent to the tissues behind the uterus, although this seems to be the case when an examination per vaginam is made. The uterus may sink lower, being drawn down by contraction of the adhesions, and it may become retroflexed when the adhesions are extensive and the contraction great. Again, the tube being smaller and displaced, the lumen is stopped, the discharge accumulates, distends, and leaks into the peritoneal cavity, a fresh

attack of peritonitis sets in, more lymph is exuded, and as the acute stage subsides the tubes and broad ligaments are rolled back and folded in more and more; as the contraction goes on, the tissues harden and the tubes may form strong cords, which, being adherent to the floor of the pelvis, fix the uterus in its retroflexed and retroverted position. Thus we have cases of retroversion with adhesions, and it is the rolled-up ligaments and the tubes which fix the uterus backward; and it is the imbedded ovary and diseased tube in the hardened tissues of the broad ligament which makes it next to impossible to insert a pessary and hold the uterus up without causing pain and running the risk of bursting or tearing a tube distended with septic or irritating fluid. By great patience and time, in many cases we can stretch the ligaments, and by force get the fundus uteri into that ideal normal position, but to keep it there is the rub; the rolled-up broad ligaments won't unroll, and when put on the stretch by the uterus being held up by force, they soon begin to ache, inflame, and may cause local peritonitis.

Now suppose only one tube is affected, the retroversion will be less, and if the other side is not affected the uterus may be even a little anteverted, unless the inflamed tube drops to the floor of the pelvis. If the ovary and the tube of the affected side are prolapsed and inflamed, as contraction takes place the broad ligament is shortened, especially on its lower side, and unless the tube and ovary are very much distended, so as to displace the uterus bodily, the cervix is drawn to the affected side, the fundus being tipped toward the healthy or less affected side, which is usually the right side, and the swollen ovary and tube may be forced backward somewhat behind the uterus. When one side only is affected, it is usually the left; the circulation on this side, from the formation of the veins and the proximity of the often-distended intestine to the left broad ligament, seems to make it more susceptible to congestion, prolapses, and disease than the right side. When both tubes are involved, the left is probably the first to become affected, this, together with the natural position of the uterus being that

with the fundus inclining slightly to the right of the centre, accounts for the fact that where both tubes are affected and the uterus is not retroverted, the cervix is drawn to the left and the fundus to the right, the left ovary and tube being prolapsed, and the right usually much less prolapsed. In nulliparous women, especially in those cases where the uterus is anteverted or anteflexed, and where the disease is gradual in its progress, this condition of right lateral flexion with the fundus forward is most likely to be found, whereas, after labor and abortions salpingitis is more freqently associated with retroversion. Sometimes the prolapsed tube, especially on the left side, is adherent to the sigmoid flexure or to the small intestine, and the omentum may have slipped down, especially when the uterus is retroverted, and become adherent over and in front of all the pelvic organs, when it has been thickened and the blood-vessels greatly enlarged by repeated attacks of local peritonitis or general peritonitis. To the inexperienced it is a formidable barrier; years ago I saw even Dr. Sims close the abdomen rather than run the risk of going through it to reach the ovaries beneath it. These are the cases where eminent men will tell you that they opened the abdomen, but could not find the ovaries and tubes, therefore closed it. When describing the operation, I think I can make it plain that by a simple procedure this apron of blood-vessels can be safely removed. It has enabled me to complete the operation of removal in even the worst cases. Where the local peritonitis is limited, as the tubes open near the ovaries which protrude through the posterior surface, the adhesions are, as a rule, confined to the posterior layer of the broad ligament. This accounts for the rarity with which the bladder is affected by the adhesions. The ureters are not uncommonly affected by the adhesions, especially when the adhesions are low on the floor of the pelvis, and in tearing up very old and firm adhesions the ureter may be lifted up (on one occasion it would have been tied had I not recognized it as it was lifted up by the operator).

Now, as to the tubes themselves, in cases of simple

catarrh, especially those associated with cystic ovaries—a combination which seems to be the most certain to produce hystero-epilepsy, hysteria, and all kinds of reflex disturbances —the tubes may be very little enlarged, but very vascular and adherent, with the lining membrane in a mild catarrhal state. Later in the disease, more commonly the tube is distended by fluid and enlarged from the size of a lead-pencil to enormous dimensions, with the fimbriæ turned in and the end of the tube closed, or the fimbriæ may be spread out and adherent to the surface of the ovary, the latter acting as a plug to the mouth of the tube. The end of the distended tube may be adherent to the side of the pelvis, or the floor of the pelvis, to an intestine, or even to the other tube. The distended tube may be, and when large is, more or less convoluted, sometimes constricted at one or more parts, and usually with the outer end much larger than the proximal end. The fluid distending the tube may be clear, transparent, watery fluid, or milky or gleety, or thick greenish-colored pus, or thin broken-down pus. Ciliated epithelium is the chief microscopical characteristic of the clear fluids. When the tube is greatly distended and the adhesions slight, it is usually a hydro-salpinx, but when large with many adhesions it is likely to be pus that distends the tube. In my cases, in the majority of instances the tubes were infiltrated with pus and serum, and degenerated rather than distended. In those where abscesses were found formed in the substance of the ovaries and tubes, the tissues were so rotten that in tying them off the ligatures cut through the degenerated stump, and I was compelled to pick up the arteries and tie them one by one. These might fairly be called cases of pelvic abscesses. In old cases the tissues may have atrophied and contracted down so that it is difficult to remove all of the ovary and have a stump long enough to hold the ligature. In most cases the ovaries are covered with the inflamed tube and shreds of adhesions, and in pyo-salpinx they may be inflamed and filled with small abscesses or infiltrated with pus, and are sometimes so degenerated that they are torn to pieces in being removed. Sometimes the

interstitial tissue of the ovary is affected, and may be hardened and contracted, or the ovary may be found abnormally small and atrophied, but the most common condition of the ovaries, if affected by an independent disease at all, is that of cystic degeneration; usually the cysts are numerous—small ones filled with a gummy, translucent fluid. Superficial cysts with thin fluid are very commonly found, but deep-seated central cysts may fairly be called cystic degeneration, and it is to this class I refer when speaking of cystic degeneration of the ovaries.

In some cases, the cellular tissue may be infiltrated and thickened by lymph, but the preparatory treatment almost always, more or less, completely removes this lymph, and the real adhesions that bind and twist the organs out of place will be found to be peritoneal.

Prevention.—When the etiology of any disease is well understood the prevention is plainly indicated. It is important that the general health and strength of girls while developing into women should be kept up, so that the generative organs will fully develop and resist catarrhal disease. When there are symptoms of catarrhal disease, such as leucorrhœa and dysmenorrhœa, they should be treated early, before it has reached the Fallopian tubes, and if the endometrium is affected by disease the uterine canal should be kept patulous so as to secure perfect drainage, and thus lessen the chance of the disease entering the Fallopian tubes. The serious nature and the almost certain consequences of venereal diseases should be explained to and impressed upon all young persons, and definite instructions should be given, especially to all male patients suffering with gonorrhœa, to avoid intercourse until complete cure is affected. No doubt many of the cases supposed to be due to septic poisons after labor are really caused by gonorrhœa contracted by husbands who have been led astray while deprived of their usual indulgence during the confinement of their wives. The serious consequences of even a slight septic endometritis in causing a salpingitis makes more forcible the great importance of cleanliness and the use of antiseptics or any other

means that may lessen the chance of puerperal septicæmia. We know that subinvolution rarely exists without, sooner or later, the development of endometritis, and instead of taking it for granted that when a woman has passed the ninth day after labor that the doctor's responsibility in the case is at an end, every lying-in woman should be examined locally before she is allowed to go about her usual duties, and it is safer to keep the woman under observation until the uterus is normal in size, position, and condition, before dismissing her. If treatment is needed, it is better to begin it not later than the end of the second week after labor. A few stimulating applications of glycerine and alum made twice a week during the third, fourth, fifth, and sixth week after labor will prevent subinvolution, retroversion, endometritis, and a salpingitis in a delicate or weak woman that without it would be pretty certain to be affected with one or more of these serious affections.

When we have an endometritis it is especially important that we should secure perfect drainage from the uterus. After abortions the greatest care should be taken to prevent septic infection and insure removal of all the placenta and membranes. Especial care should be taken to secure perfect involution and drainage of the uterus, for after labor nature generally accomplishes this without help, but not so in abortions. Labor is normal, but abortions are abnormal, and must be regarded as almost certain to result in disease.

Treatment.—During the acute stage complete rest in bed is the best treatment; anodynes and counter-irritants may be used; as the active symptoms subside, I begin the application of thin pledgets of cotton saturated in pure glycerine and applied to the cervix and vagina; they are left in place twenty-four hours, then removed and a douche of hot water given; on the third day another pledget is put in, and this is kept up for a week or two; and later a solution of one part of boro glyceride, one of alum, and fourteen of pure glycerine is used to saturate the cotton in place of pure glycerine. After a week or so this softens out the products of inflammation and renders the uterus more movable, and

enables one to make a more accurate diagnosis. It improves the circulation, and often gives, for the time, more or less complete relief to all the local symptoms. While this simple local treatment is given, close attention should be paid to the general health, and the condition of digestion, and especially the bowels should be carefully regulated, for impacted fecal matter in the lower end of the descending colon or rectum may materially add to the pain and the effect of the disease by pressing directly on the left broad ligament.

After getting the uterus movable, so that it can be pulled pretty well down with the tenaculum without causing much pain, it will be safe to sound the uterus, and, if the canal is contracted and hyperæsthetic, it should be gently dilated so as to secure good drainage and enable applications to be made to the mucous lining. If there is a history of excessive hemorrhage, and it is not corrected by tincture cannabis indica, twenty gtts. given twice a day, if the uterus can be gotten movable by the use of the medicated pledgets, it will be safe to curette the uterus for the removal of granulations. I would always give the above treatment as preparatory to operation, except in those cases where the diagnosis was plain and indicated immediate action to prevent rupture of a painful cyst, or to prevent septic poison and death after rupture. In these cases I would resort at once to the operation for removal. Aspiration through either the abdominal wall or vagina can give only temporary relief by evacuating the contents of a cystic tube or ovary, but there is some risk and little or no permanent good attained. Where a large amount of pus had accumulated in three cases, and abdominal section would not be permitted, I have resorted to a simple method of opening and draining. With a long and curved trocar I punctured the walls of the abscess, being careful to pass the trocar directly behind the cervix so as to avoid large bloodvessels and the ureters. After passing the trocar the canula was withdrawn and the pus evacuated, and the cavity repeatedly washed out with solution 1 to 5,000 mrc. bichl. With canula still in place, I turned patient on her side in Sims' position, and introduced

Sims' speculum in the vagina; then I passed through the canula a small probe without a handle, and slipped the canula out over the probe, using the probe as a guide; with Sims' uterine dilator I dilated the opening so that I could pass my finger into the abscess. By means of a pair of slender forceps I carried into the abscess a large-sized drainage tube of soft rubber; in this way I avoided the use of a knife and the risk of cutting a blood-vessel or the ureter. To prevent the tube from slipping or being forced out as the cavity of the abscess contracts I passed a silver suture through the posterior lip of the cervix and the wall of the drainage-tube and tied the tube to the cervix. The cavity was washed out with an antiseptic solution as was indicated by the discharge and temperature of the patient; as the discharge diminished, the large tube was replaced by a smaller one, and the opening kept dilated until all drainage ceased.

One of the three cases seemed to be permanently cured and all were helped, but I would not advise this treatment, except in those cases where abdominal section is not allowed, or where there seems to be only one large cyst, such as is sometimes found following a broken-down hæmatocele. In most cases the abscess or distended tube is too small to be reached safely in this way. If, after opening the abdomen and finding a large pus cavity, I wish to make a counter-opening through the vagina, I would make a small opening with a trocar and then dilate it with dilators. In case of a large pelvic abscess pointing toward Poupart's ligament, I would open by an incision in the groin and would not enter the peritoneal cavity above the abscess, except to secure complete removal or to get perfect drainage.

When diseased tubes are plainly made out and the patient is bedridden, or suffers to such an extent that after being clearly informed as to the effect and danger of the operation and consents, then we consider complete removal of both tubes and ovaries, if both sides are affected, to be justifiable. By softening the indurated tissue and improving the circulation of the pelvis we can help but not cure. By atrophy and absorption nature may cure, but chronic invalidism

usually comes before nature has effected a cure. Or, by the bursting of a distended tube, general peritonitis and death may follow instead of the usual attack of local peritonitis. Many a case of so-called idiopathic peritonitis has been caused by the bursting of a diseased Fallopian tube, and the patient might have been saved by a bold surgeon even after the peritonitis set in.

Operation for removal.—I do not expect to improve upon Mr. Tait's work as an operator, but I think I can make the operation easier to others by describing a methodical way of doing the operation for removal of the tubes and ovaries, in cases where the adhesions are extensive.

After giving the preparatory treatment with glycerine and alum pledgets as described, and having decided that an operation is proper, I have the patient's bowels well emptied and put her on pancreatized milk diet with very little other plain food for three or four days previous to the operation, the object being to remove all impacted fecal matter, and to lessen the amount of gas in the intestines, for the latter may be very troublesome by crowding down around the pelvic organs and out through the incision in the abdominal wall during the operation. When well prepared, there will be little or no gas in the intestines, and they will be found to be like so many slippery ribbons. The day of the operation the bowels should be well moved, but not excessively.

In all surgical practice I would place cleanliness first, drainage second, rest third, and antiseptics fourth. If we could be perfect in cleanliness, antiseptics would be useless. Some of us are willing to be considered fallible and use antiseptics to make up for it. Before Lister made perfectly plain the necessity of cleanliness and proved the value of antiseptics, not many of us were so particular about cleanliness, nor did we know how important it was to success in surgery. Cleanliness is better than antiseptics, just as prevention is better than cure. Before Lister's teachings, what surgeon spent hours in cleaning instruments and sponges, and placed over wounds a thick layer of absorbent cotton-wool? Cotton-wool is known to be the best

thing to prevent the passage of germs and their spores, and he who uses it for dressing wounds carries out the principles taught by Lister.

Before operating, my patient is thoroughly bathed and clean clothing for her body and bed ordered; just before being etherized, one quarter to one-third of a grain of morphine is given hypodermically. When under ether, the abdomen is shaved well down to the pubic bone, and thoroughly washed with soap and water, and before the skin is cut, again well washed with a solution of one to five thousand of mercuric bichloride. Instruments are all kept in solutions of from one to twenty No. 1 Calvert's acid. carbol., and sponges in a solution of one to ten thousand of mercuric bichloride. Besides the operator only four assistants are needed: one to give ether, one to handle instruments, one to clean sponges, and one to stand opposite the operator and sponge. Ordinarily the man to hand instruments can be dispensed with, and I do not use any one for this purpose except in my hospital clinics, for of course the number of persons helping adds to the danger of infection. All assistants are required to wash as clean as possible, and use solution of bichloride afterward.

In putting the patient on the operating table, I place a soft pillow under the shoulders and one under the head, and have the feet so fixed as to keep the knees about level with the abdomen. This relaxes the abdominal wall to some extent. The bladder is emptied, and the abdominal incision is made just above the pubes. The length of incision in the skin being from two and one-half to three inches, according to the amount of fat in the abdominal walls, the opening in the peritoneum being only large enough to allow the free use of my index and middle fingers at the same time. This opening is rarely made larger, unless the size of the distended tube or ovary makes it absolutely necessary in extracting them. A large opening is avoided, because it adds to the risk of septic poisoning, and makes ventral hernia more likely to follow. When ovarian and other large tumors are removed, the abdominal walls are relaxed, and there is less

tension on the sutures and perfect union is more readily secured than in those cases where the abdominal pressure is normal.

When the subperitoneal fat is reached, it may be troublesome to get through it, for there is no distended tumor directly underneath it to keep away intestines and hold the many layers of the peritoneum together, and where gas is in the intestines this difficulty is increased. Where the omentum is free from adhesion, it can be pushed up as one would the end of an apron. When it is adherent, as it often is, to the broad ligament and anterior wall or top of the uterus, it cannot easily be separated by pulling it from below upwards; but by passing the two fingers well to one side and getting them underneath, and separating the adhesions, many formidable looking cases can be easily managed. As the adhesions separate, they should be lifted through the opening and any bleeding points tied. The principal vessels in adhesion of the omentum come from those of the omentum, and not from the pelvic organ; therefore, the end of the omentum is the part to be tied. If the adhesions are strong and vascular, as they may be in those cases where there have been repeated attacks of local peritonitis, then the omental adhesion can be tied off, tied first as low as possible, and then a little above this, and cut between the ligatures. By pulling the sides of the abdominal opening laterally with retractors, we can do this without enlarging the opening in most cases. In handling and tying the omentum, care should be taken not to split or tear it, for it will invariably bleed up in the angle of the split, and may be very troublesome. Where the uterus is retroverted, the removal of the omentum, as a rule, frees the anterior part of the fundus and the anterior face of the broad ligaments; often the small intestines will have to be separated, but they are not often firmly adherent. The next step is to elevate the uterus by placing the fingers behind it. The back of the fundus may be adherent, but, as a rule, it is free and is held back by the twisted and rolled-up state of the broad ligaments. The ovary will be found folded under the tube

and broad ligament, and to get it up we must go down through the broad ligament, or we must unroll the broad ligament. I have seen the former done several times, and it always adds greatly to the length of the operation, and necessitates tearing or tying off the outer attachments of the broad ligament before the tube can be gotten up and tied off with the ovary. Now, by putting both fingers directly down behind the uterus, and running the fingers laterally, guided by the Fallopian tubes, as it is given off from the uterus, and gradually separating the adhesions and unrolling till we get under the ovary, the tube and ovary can be gotten up easily in the worst cases; where the adhesions are very firm, an assistant's finger in the vagina as a guide may be useful, for in scratching loose the adhesions the ureter may be lifted up, and the sigmoid flexure or rectum may be torn up, for it may be adherent to the tube or ovary on the left side. When both sides are adherent it may be well to lift up both sides before trying either; although in some cases, where the bleeding is free, it may be better to tie the first one lifted up. In three cases I found the tissues so degenerated that my ligature cut through, and compelled me to slightly enlarge the abdominal opening and tie the arteries after picking them up with a bull-dog forceps. Where the tissues are frail and ligatures inclined to cut easily, it is safer to remove the tissues and tie the arteries separately. Two or three arteries will usually be found. Where the broad ligament is much enlarged, we may tie with two ligatures, one double ligature including the ovarian ligament and the tube within half an inch of the fundus, the other single and tying off the outer end of the broad ligament. The pampiniform plexus may give trouble, but I have seen it so degenerated as to pull to pieces, in being tied. I use firmly twisted Chinese silk, and prefer to pass the ligature with a needle something like an aneurism needle, with a sharper point and longer handle than those found in the shops, to carry a double thread.

In tying, except in cases where one double ligature will suffice, I do not use Mr. Tait's Staffordshire knot, but I

cross and interlock the two loops of all my double ligatures, and so far I have never had a ligature slip after the operations. After tying, before cutting off the tube and ovary, I catch the tissue with pressure-forceps close to the ligature, so that I can cut off my ligatures and not be tempted to use them to lift up the pedicle after being once tied. Besides enabling me to keep the pedicle in sight, these forceps act as guides in cutting away the tube and ovary. Often the ovarian ligament is so short that it is not easy to get a satisfactory stump left and cut off all the ovary. I like to have a Paquelin cautery on hand, so as to touch any suppurating end of a tube in a stump or ovarian tissue that may be left on it after tying. The tubes and ovaries of both sides should be removed if there is the least sign of salpingitis; but in two cases I found only the left side affected, the right tube and ovary being free from even a single adhesion, and I removed only those of the diseased side.

The cavity should be thoroughly dried with sponges and time given for hemorrhage to make itself manifest before the wound is closed. Where there are extensive adhesions or any pus cavity disturbed, or especially where there is any ascites, a drainage-tube should be put into the pelvic cavity. I prefer a large-sized tube of glass with some small holes in the sides besides the ends being open, and I use a large-sized catheter attached to an ordinary syringe for washing out the tube when needed. If there is no drainage I remove the large tube in thirty-six hours and slip a small rubber drainage-tube in its place, and the next day a still shorter and smaller one, each day until about the seventh day, when the opening will usually be filled up from the bottom. In introducing the sutures in the abdominal wall, I am careful to secure not only perfect coaptation of the peritoneal coats, but also of the deep and thick abdominal fascia, for if good union of this is secured the risk of ventral hernia is very much lessened; for it is this tissue and not the muscles, which are longitudinal, that gives strength to the abdominal wall in the median line. For thirty-six to forty-eight hours nothing is allowed to be taken except teaspoonful doses of

water or broken ice, and enough morphine is used to prevent pain and restlessness, for several days. An enema is usually given on the sixth day to move the bowels, and sutures are removed on the eighth day. Either medium silk or silver wire is used in sutures for the abdominal walls.

If the abdominal walls are thick from adipose tissue, as a rule, the peritoneum will be found tense, and require more than usual care in closing properly. In such a case, after putting in from three to six silk sutures through the skin, fascia lata and peritoneum, the peritoneum should be carefully closed with catgut sutures, and the fascia lata also separately closed in the same way. Then the first silk sutures should be closed, leaving room between them, in two or more spaces, for short drainage-tubes placed upright so as to drain the adipose tissue between the fascia and the skin. Or if the walls are closed by silk sutures in the usual way, the skin, a little to the side of the cut, should be punctured so as to give vent to the grease that is certain to escape from the more or less bruised adipose tissue. I have seen mural abscess caused by this free fat, and it might enter the peritoneum and cause greater trouble. After sewing up and cleaning the wound, it should be freely sprinkled with iodoform and covered with a layer of absorbent cotton that has been squeezed out in one to five thousand mercuric bichloride, and over this several layers more of dry absorbent cotton, so that the whole abdomen will be evenly compressed when the adhesive straps and band are put on. Over the cotton a folded towel and mackintosh are placed, and firmly compressed by adhesive straps and a bandage. Except where a drainage-tube is inserted, this dressing can remain until the eighth or ninth day, when the sutures are removed, unless oozing appears through the dressing, or a rise of temperature takes place indicating septic poisoning, etc. In cases with extensive adhesions or in pyo-salpinx, especially where the tissues are infiltrated, we must expect a moderate rise of temperature during the first two or three days, caused by the small amount of septic material left in the pelvis; but this is readily absorbed and the local peritonitis caused

by it soon subsides, and on the fourth or fifth day the temperature falls. When the case fails to rally well, and has a temperature at or below normal, or in some cases where all symptoms are favorable and temperature low until the afternoon of the third or on the fourth day, the temperature makes a steady rise, you have, as a rule, a fatal case of septicæmia to deal with, that death alone will stop—which it usually does inside of two or three days. Sometimes a case begins as a local peritonitis and gradually spreads to general peritonitis, vomiting, and death. Still, I think the proper name for such a case is septicæmia.

Complications.—As endometritis nearly always precedes salpingitis, it is necessarily a frequent complication. It is rare to find salpingitis uncomplicated by local peritonitis, and this, by the formation and contraction of bands of adhesions, distorts and displaces the pelvic organs and makes more or less permanent any displacement that may have previously existed. This was fully brought out in describing the treatment. The most serious and dangerous complication is the rupture of a tube distended with septic fluid, causing general peritonitis and septicæmia. Should this happen and be diagnosed, or be indicated as the probable cause of peritonitis, it would be proper to open the abdominal cavity, remove the tube, and wash out and drain the peritoneum. The inflammatory process may become so intense in or about the tube as to cause the tissues to break down, and form so large an abscess that the surrounding tissues lose the power to protect themselves, and a perforation takes place into the rectum, vagina, abdominal wall, or through one of the openings in the pelvis, or into the bladder. This necessitates enlarging the opening to secure drainage, and often before a cure can be effected counter-openings are necessary, and if these fail, an operation for removal must be resorted to.

I have here for presentation the specimens from twelve of these cases, with a report on each by Dr. Henry C. Coe, Pathologist to the Woman's Hospital of the State of New York. Nine were operated on in Bellevue Hospital and five

in private practice. Twelve of the fourteen recovered, and two died from the effects of the operation. Both of the latter were hospital cases, and both died on the fifth or sixth day from septicæmia.

"CASE I.—Mrs. R——, aged thirty-two, married, the mother of two children, has had two miscarriages. Her present trouble dates from an abortion, three years ago, although she has always suffered from more or less dysmenorrhœa. She complains now of severe dragging pains on both sides of the pelvis. Two years ago she underwent an operation for lacerated cervix. Examination reveals the uterus movable, but retroverted, the tubes and ovaries prolapsed, sensitive, enlarged, and easily made out, while by slowly pressing the left tube a gleety pus can be made to appear in the vagina. Operation, May 26, 1883. She made a good recovery from operation.

"*Examination of specimens.*—Both tubes are found dilated and adherent to the corresponding ovaries, which appear to be the seat of a chronic ovaritis. The distal end of one of the tubes has been found so fused with the ovary, as the result of old inflammations, that the fimbriæ and opening have been entirely obliterated. In the other tube, which is less dilated, the lumen is patent. Microscopic examination of the contents of the most diseased tube showed it to consist largely of pus and fatty degenerated epithelial cells. A few ciliated cells were also noticed. A small amount of pus was observed in the fluid taken from the other tube.

"Notwithstanding the fact that both tubes were completely removed, the patient has menstruated, with one or two exceptions, regularly every month. The amount of flow became excessive, lasting eight or ten days. She was curetted; but three months later, after menstruating regularly, it was necessary to curette again, and nine months later curetting was repeated. Granulations were found each time, but nothing malignant was discovered by a careful examination made by Dr. W. H. Welch. Now, nearly two years after the operation, she still menstruates every month, but is able to go about, and except for a ventral hernia would be comparatively well. The uterus is a little above the normal size.

"CASE II.—M. I.——, aged twenty-five, a native of France, married, but no children. Was admitted May 30, 1883. She gave a history of gonorrhœa, and complains of

pain over the ovaries, dysmenorrhœa, and leucorrhœa. On examination the uterus was found retroverted, and after some treatment a prolapsed tube and enlarged ovary were also discovered. Operation, June 25, 1883. The patient made a good recovery, but still complained of pains, notwithstanding both ovaries and tubes were removed. She was kept under observation till September, and then discharged. It was afterwards heard that she had a ventral hernia.

"*Examination of the specimen.*—Both ovaries and tubes were removed in the operation. It was found that the one ovary and the fimbriated extremity of its corresponding tube were so fused together that they could not be separated. The appearance presented was such as to suggest a normal tube terminating in a cystic ovary. On passing a probe through the cut end of the tube, a portion of this cyst is found to be the dilated tube, though the line of separation between the latter and the cystic ovary could not be made out. Many adhesions were also present. A drop of the watery fluid obtained from the tube was found to contain a small amount of pus, broken-down cells, and granular débris. Some ciliated cells were still preserved, as if they had been among the last to suffer disintegration. The condition in this tube was one rather of hydro- than pyo-salpinx. The other ovary was small and atrophied. The tube was distinct from the ovary. Its fimbriæ had entirely disappeared, and at the distal end there was a small but distinct cicatrix marking the site of the inflammatory process which obliterated the opening. A probe can be passed through the tube from the cut end, but is arrested at this artificial septum. The tube contains a reddish fluid, a drop of which shows, under the microscope, pus, broken-down cells, and granular débris.

"CASE III.—T. S——, twenty-seven years of age, a native of Italy, married, the mother of two children. Admitted April 28, 1883. She suffers from dysmenorrhœa and leucorrhœa. For more than a year she has had a severe pain in the right iliac fossa, which, since the birth of her last child in February last, has been excruciating. She gives a history of gonorrhœa, which was confirmed by vegetations in the vagina. On examination the physical signs of a local peritonitis are found. Operation, October 28, 1883, shows a catarrhal state of the tubes and indurated ovaries. She made a good recovery, but still suffered much from the old pain, but gradually got better and was discharged cured December, 1883.

"*Examination of specimen.*—The ovaries * obtained from this case show a decided increase in the density of the fibrous stroma and thickening of the cortical zone. A few cysts are also present. The tubes are long and tortuous, but appear to be of normal size. Their fimbriated extremities are normal, and the lumina patent throughout. The specimen is so shrunken that it is impossible to say whether the tubes were originally diseased or not, probably they were not affected.

"CASE IV.—A. S——, a native of Ireland, thirty-one years of age, married, and the mother of two children. Admitted November 1, 1883. She is suffering from dysmenorrhœa. For the last ten years she has vomited several days every month, and besides suffers from severe pain in the right iliac region. Her general health is poor. On examination the uterus was found displaced to the left and more or less fixed; marked pelvic adhesions were present; the ovaries were sensitive. Operation, December 8, 1883. It showed that the omentum was adherent over the pelvic organs, and that both ovaries and tubes were fixed by fine adhesions. The pedicle was so short that both sides had to be tied a second time, and on the right side the arteries had to be picked up with artery forceps on account of the slipping of the ligature. To do this the abdominal opening had to be made larger and kept exposed for nearly an hour. All bleeding was, however, effectually stopped. The patient did not rally well, but there was little rise of temperature till the fourth day, when it steadily increased, and at the end of the fifth day had reached 106°. Death occurred from septicæmia.

"*Examination of the specimen.*—One tube showed but little change. It had become adherent to the ovary, probably as the result of an old peritonitis. There was marked dilatation and thickening near the fimbriated extremity, but the lumen was patent. The corresponding ovary was cystic. The opposite tube was considerably enlarged, its wall thickened, and dilated near the distal end. The fimbriated opening was buried in a mass of old adhesions. The fluid removed from this tube contained pus in small amount, granular epithelial cells, and a considerable amount of granular detritus. Several groups of columnar epithelial cells were seen, a few of which still retained their cilia.

* The specimen has been preserved for several months in chromic acid, and hence is nearly useless for gross examination.

"This specimen was seen when fresh by Dr. Welch; he noted much congestion of the tubes, and marked pelvic peritonitis.

"CASE V.—Miss B———, a native of United States, twenty-three years of age, single. She has suffered for several years from slight dysmenorrhœa and leucorrhœa. She gives a history of hystero-epilepsy commencing several years ago, and becoming more and more severe, till now she has sometimes a number of severe attacks each day. Physical examination showed the ovaries enlarged, and plainly to be felt, of the size of English walnuts. The uterus was movable and in its normal position. The tubes could not be made out as enlarged. Operation, December 3, 1883. The patient made a good recovery, without a single bad symptom. Both ovaries and tubes were removed.

"*Examination of specimen.*—Only one tube and ovary preserved. The ovary is of the size of an English walnut and extensively diseased. The capsule is thickened, and at the periphery a large cyst is seen. As the organ gives an obscure sense of fluctuation, it is doubtless cystic throughout. (The ovary in the specimen was entirely separated from the tube, and only a small piece, about one and a half centimetre, of the corresponding tube has been preserved, and this is hard to distinguish, except by laying it open and examining the lining mucous membrane under the microscope.) The fimbriated end was originally closed by a cicatricial mass, which was divided. There is a small cyst of the broad ligament just below the obliterated distal end. No fluid was found in the tube.

"CASE VI.—*Hydro-salpinx* (*hospital patient*).—M. B——, a native of Ireland, married, one child. Admitted, November 17, 1883. She is bed-ridden, and has been treated for menorrhagia. She complains of severe pain and tenderness over the left side. Examination shows the uterus retroverted somewhat, and a mass the size of a small hen's egg can be felt to the left of the fundus in the left broad ligament. Operation, January 27, 1884. Notwithstanding a slight rise of temperature the first three days after the operation, she made a good recovery. The left ovary and tube were found enlarged and diseased, but the right perfectly normal and free from adhesions, and were therefore left undisturbed.

"*Examination of specimen.*—Inspection of the diseased tube shows it to be enlarged to the size of a finger, and its walls much thinner than normal. Evidences of adhesion

are to be seen all over its exterior. The distal opening has been entirely obliterated, evidently the result of previous inflammation. The accompanying ovary is enlarged to the size of an English walnut. It was evidently much larger before removal, as it contained a central cyst as large as a marble. The fluid found within the tube contained nothing but a large number of round and columnar epithelial cells. Many groups of well-preserved ciliated cells were found, looking as perfect as if they had just been removed.

"CASE VII.—L. D——, twenty-eight years of age, married but sterile. Admitted September, 1883. She suffers from dysmenorrhœa, has been bed-ridden for months at times, and has already been in four hospitals. She complains of pain in the back and head, and vomits almost every day. Her pulse is always over 100. For several years she has been unable to work, and is completely demoralized. When examined, the uterus was found retroverted fixed, the tubes and ovaries could be made out slightly enlarged. Operation, March 3, 1884. She did well for two weeks, when the temperature rose to 104° but this was unaccompanied by pain or tenderness. She had also a slight cough, and this together with the elevated temperature, was regarded of pulmonary origin. Gradually, however, she got stronger, and was discharged cured September, 1884.

"*Examination of specimen.*—The ovaries are found to be of normal size, but cystic. The corresponding tubes are enlarged and dilated. The condition is nearly the same as in Case I., except that here both distal apertures seem to have been obliterated by old inflammation. One tube is closely adherent to the corresponding ovary, the other only partially. They both give a distinct sense of fluctuation, and on introducing a needle a watery fluid is obtained which shows under the microscope a few mucous corpuscles and normal epithelial cells. A considerable number of perfect ciliated cells were also present. The condition may be termed one of moderate hydro-salpynx.

"CASE VIII.—Mrs. Mc——, a native of the United States, aged twenty-seven, married and has had one miscarriage at four months, but no children. She has suffered greatly from dysmenorrhœa and menorrhagia. Her general health is poor, and she has been a confirmed invalid for the last ten years, being confined to bed most of the time. She complains also of an almost constant pain in the iliac region, back, etc. Examination shows the uterus anteverted; the

left ovary and tube enlarged and adherent; the ovary also enlarged. Operation, March 13, 1884, and it was found that the right ovary was slightly adherent and cystic, while the left tube and ovary were enlarged and very firmly adherent. The patient recovered without a single bad symptom. Examination of the removed tubes and ovary showed the one tube and ovary normal to all appearance, although the wall of the tube seems to be a little thicker than usual. The other tube was uniformly enlarged, and its mucous membrane swollen. The lumen was patent, but no fluid was present. The corresponding ovary was enlarged and cystic. The condition was probably one of catarrhal salpingitis, leading to hypertrophy of the mucous membrane, and perhaps, also of the muscular layer of the wall of the tube.

"CASE IX.—H. D.——, colored, a native of United States, aged twenty-seven, married, but sterile. Admitted February 3, 1884. She is suffering from dysmenorrhœa, and has had severe local pains in the left iliac region for the past three years, making her a complete bed-ridden invalid. Examination showed the uterus anteflexed and firmly fixed, and the enlarged ovaries and tubes could be felt, especially on the left side. Operation, March 20, 1884. She had adhesions, about the worst I ever saw, the omentum, bladder, intestines, etc., being all involved. A pedicle on the left side could not be secured, and the arteries were picked up by forceps, necessitating a prolongation of the operation and exposure of the peritoneum. She gave symptoms almost identical with Case IV., and died of septicæmia on the fifth day. Both tubes and ovaries were removed in the operation.

"*Examination of specimen.*—Both tubes were found to be enlarged and thickened, but not dilated. They were buried in masses of adhesions, though the lumina seemed to be open. Both ovaries were the seat of marked cystic degeneration. In one broad ligament was a cyst the size of a large walnut. Microscopic examination of the mucous membrane of the tubes showed it to be much swollen and covered by leucocytes. No epithelial cells were preserved. In this case there had probably been a chronic catarrh of the tubes, which led to thickening of the mucous membrane. Some of the thickening could also be attributed to an old peri-salpingitis.

"CASE X.—Mrs. O——, aged twenty-five, married two and a half years, but sterile. Before marriage she was per-

fectly well, but soon after this she began to suffer from dysmenorrhœa and leucorrhœa. For more than a year she has had severe pains first on the right and then on the left side. Lately she has also suffered from menorrhagia. Examination showed the uterus anteverted and imbedded in a mass of indurated tissue, and the enlarged ovaries and tubes could be also made out. She was kept under observation and treatment for a year previous to operation. The operation was performed May 1, 1884. The omentum was found covering all the pelvic organs. Both ovaries were imbedded in a mass of adhesions and very much enlarged. The left ovary was of the size of a lemon and filled with abscesses. The corresponding tube is firmly adherent and infiltrated with pus. The right tube and ovary are not as much enlarged, but a number of small pus-centres were noticed as the adhesions were broken up. The patient made a good recovery, except that an abscess formed around the stump on the left side and the track of the drainage-tube discharged for several months. Pyo-salpinx and ovaritis. Specimen accidentally thrown away.

"CASE XI.—M. H——, aged thirty-two, married, and has had one child and three miscarriages. Admitted September, 1884. She is suffering from dysmenorrhœa. She had a miscarriage six months ago, and for nearly two months had had a septic fever. She complains of a severe pain in the iliac region. On examination the uterus is found retroverted; the ovaries and tubes enlarged and sensitive. Operation, October 9, 1884. Extensive adhesions were found, the omentum, small intestines, etc., being involved. The tissues of the tubes and of one ovary were so softened and infiltrated that the ligature cut entirely through the pedicle, and the blood-vessels had to be picked up and tied separately. Abscesses on both sides, involving the ends of the tubes, were met with. A drainage-tube was inserted and the patient made an excellent recovery, and was discharged cured, November 18, 1884, all pains relieved.

"*Examination of specimen.*—The specimen obtained from this case is the best in the collection. It consists of two greatly enlarged tubes with their corresponding ovaries. The smaller of the tubes is about the size of a large lead pencil, and shows on its exterior evidence of previous inflammation. The accompanying mesosalpinx is much thickened. The fimbriated extremity of this tube is patent, so that on compressing the walls a quantity of thick, reddish-yellow fluid

escaped. This on examination was found to contain pus, fatty degenerated epithelial cells, free fat, fatty acid crystals, and bits of smooth muscular fibres, but no ciliated cells. The other tube is as large as the forefinger, much distorted, and its fimbriated extremity buried in a mass of adhesions, which also partly envelop the ovary. The distal end is completely closed. The corresponding ovary is cystic; its cortex greatly thickened. There are many evidences of recent peri-oöphoritis. The opposite ovary is nearly normal in size and appearance. The fluid removed from the larger tube contains a large amount of pus and fatty degenerated epithelial cells, and much free fat. Groups of columnar epithelial cells are found, but no ciliæ are observed. There are numbers of spindle cells from the muscular layers, pointing to advanced changes in the wall of the tube. This is a typical example of pyo-salpinx.

"CASE XII.—Miss W——, twenty-eight years of age, single. She suffers from very severe dysmenorrhœa. She complains of pain in the back, head, neck, etc., and has been a confirmed invalid for several years. Examination showed the uterus retroverted and retroflexed, being held back by bands of adhesions, and very sensitive and boggy. The tubes could not be made out as enlarged. The ovaries are prolapsed and seem cystic. Operation, October 20, 1884. Extensive adhesions were found, although the tubes were the principal bands holding back the uterus. They were thickened, but not distended. The ovaries were cystic and fixed by adhesions. The patient made a good recovery. The specimen was lost.

"CASE XIII.—Mrs. C——, a native of the United States, married, and the mother of one child. Admitted October 30, 1884. She suffers from dysmenorrhœa, and has had severe pain in the left iliac region since the birth of her child. On examination the uterus was found laterally flexed, and the enlarged left ovary and tube could be plainly made out in the left broad ligament. Operation, November 29, 1884. The left ovary and tube were removed (the right being normal). The patient made a good recovery and left well when discharged, December 28, 1884.

"*Examination of the specimen.*—The ovary is atrophied and buried in a mass of adhesions. The peritoneal surface of the tube is thickened, intensely congested, and covered with adhesions. The same is true of the meso-salpinx. The tube is enlarged to two or three times its normal size, its walls

are thickened, and it gives, on pressing it between the fingers, an obscure feeling of fluctuation. The fimbriæ are still preserved, and the constriction of the lumen seems here to be at the proximal rather than distal end of the tube. On pressing the tube the pus flows from the fimbriated end. This examined microscopically is found to contain a large number of pus corpuscles, fatty epithelial cells, and granular detritus. Several quite perfect ciliated cells were also seen.

"CASE XIV.—M. C——, a native of Italy, married, has had three children and two miscarriages. Admitted October 15, 1884. She is suffering from menorrhagia, and complains of intense pain, chiefly in the right iliac region, for the last three years. On examination the uterus is found fixed and adherent, being drawn backward toward the sacrum. Under ether an enlarged tube can be plainly felt on the right side. Operation, December 8th. The patient made a good recovery and was discharged January 8th, the pain being completely relieved.

"*Examination of specimen.*—One ovary is about twice the normal size, and seems to be almost entirely made up of one large cyst. The other is considerably atrophied. The tube corresponding to the larger ovary is enlarged to twice its normal dimensions, and the fimbriæ have disappeared, the fimbriated opening being obliterated by old adhesions. The proximal cut end admits a large probe, and a drop of yellowish fluid can be squeezed from it, which shows, under the microscope, pus, broken-down epithelium (some with perfect cilia), and a large amount of granular débris. The other tube is enlarged, much distorted, and is bent on itself near the fimbriated end, so that the fimbriæ seem to spring almost from the middle rather than from the end of the tube. A probe may be introduced into the distal opening for a short distance. There are evidences of previous inflammation, leading to thickening of the mesosalpinx and peritoneal covering of the tube. A drop of fluid, obtained from the distended distal end, is shown by microscopic examination to contain a moderate number of pus corpuscles, many round, pyriform, and columnar ciliated cells, free nuclei, and granular detritus."

The hospital cases were selected from patients presenting themselves for treatment at my clinic at the New York Polyclinic, where, during the past two years, I personally

examined 607 individual women. Of this number 125 had unmistakable evidence of peri-uterine inflammation, and of these the tubes were plainly made out as enlarged in 18 cases on the first examination. By the use of glycerine and glycerine and alum tampons in many others of the 125, diseased tubes could be made out after the thickened peritoneal adhesions had been stretched and softened. In those cases where diseased tubes could not be defined by the touch, all other symptoms often indicated that they were diseased, and my studies lead me to the conclusion that peri-uterine inflammation which is not associated with diseased Fallopian tubes is the exception, and that, as a rule, disease of the tube precedes the local peritonitis.

No. of case.	Age.	Condition.	Children.	Miscarriages.	Disease.	Result.
I..	32	Married.	2	2	Pyosalpinx.	Recovered.
II..	25	"	0	0	"	"
III..	27	"	2	0	Catarrhal s.	"
IV..	31	"	2	0	Pyosalpinx.	Died.
V..	23	Single.	0	0	Catarrhal s.	Recovered.
VI..	29	Married.	1	0	Hydrosalpinx.	"
VII..	28	"	0	0	"	"
VIII..	27	"	0	1	Catarrhal s.	"
IX..	27	"	0	0	Pyosalpinx.	Died.
X..	25	"	0	0	"	Recovered.
XI..	30	"	1	3	"	"
XII..	28	Single.	0	0	Catarrhal s.	"
XIII..	26	Married.	1	0	Pyosalpinx.	"
XIV..	31	"	3	2	"	"

VALEDICTORY ADDRESS.*

By FORDYCE BARKER, M.D., LL.D.,

RETIRING PRESIDENT, (COLUMB. ET EDINB.)

In now closing my official relations with the Academy, it is both a pleasure and a duty to briefly recall the more prominent features in its history during the period of this connection. I will also venture to offer a few suggestions derived from my long experience in this position, as to some points relating to its future growth, its increasing usefulness, and its influence on the profession. As I know you will be impatient for the intellectual feast which is to follow in the address of my successor to this Chair, I shall be as brief as is consistent with a clear statement of the points to which I think it desirable to ask your attention.

It has been my good fortune to hold this position when the profession were becoming more alive to the importance of this Institution, and more and more ready to contribute material aid for its growth and support. At the same time, there was a new development of mental activity in the profession, not only in this City, but all over the world, demonstrated by great and important discoveries in science, and a wonderful increase and valuable additions to medical literature.

As I have referred to these facts more in detail in former addresses before the Academy, I will not detain you now by further allusion to them. I will only briefly refer to a few

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* Delivered before the New York Academy of Medicine, February 5th, 1885.

of the most notable events connected with the Academy, during my administration.

First to be mentioned is this new and commodious Hall, which could not then have been built except for the munificent donation of one noble benefactor, Dr. Abram DuBois, and the contribution to the full extent of their hard-earned means by many others. We are rapidly outgrowing our new Hall, and must soon have another, as our library is now nearly filled. As I learn from Mr. Brown, our excellent assistant librarian, the Academy had, when this Hall was built in 1879, about 9,000 volumes; it now has about 25,000 volumes and 15,000 pamphlets. Its circulating department has about 6,000 volumes, which our Fellows can take out of the library for consultation at home. In our Journal room, open as is the library for all who may wish to read in our rooms, there are 225 medical journals in all languages in which there is to be found a medical literature.

The Academy is greatly indebted to Messrs. Wm. Wood & Co., and D. Appleton & Co., for large donations of their new publications, and I believe to some foreign and other American medical publishers. We gratefully acknowledge the generosity of these gifts, and we feel assured that they were made from entirely generous motives. But we may be permitted to express the conviction that both publishers and authors will find it a wise business policy to place a copy of every new medical work in our library, as it has been estimated by a competent authority that one copy of every new good book in this library will secure a sale of at least ten more. The library is visited not only by the profession of this city, but by medical men from all parts of the country, who come to this great metropolis. They have seen in some medical journal a notice of a book, but have not remembered who were the publishers; in coming to our library, they examine it to see if it is what they want.

The next notable event in the history of our Academy, since I have held this position, is its absorption of another very important organization, the Journal Association, which, to quote from a former address, "not only added

largely to our library, but also to our moral and intellectual power."

The truth of history demands that the fact should be mentioned that, nearly two years ago, the Academy passed through the segment of a cyclone; but, like a good steamship driven over a sandbank near a lee shore, with its engines temporarily disabled, it escaped being hogged, its seams were not opened, its barnacles have been scraped off, its bottom has been cleaned, and it has since gone on its voyage with favoring winds and fine weather. All who are familiar with its past history, and who are unbiased by personal feeling or prejudice, must agree that the Academy has more nearly approached its avowed aims and its high purposes during the past year than in any former one since it was founded. It has had a larger increase of prominent men, and of young men of promise, than in any previous year since that in which it was organized, with the exception of the year when the Journal Association came into it. More than four times as many papers have been offered to me than there have been sessions to listen to them, and as these sessions had been promised to previous applicants, months before, very many of these papers have been withdrawn. I have afterwards seen them, not only in the medical journals of this city, but others in the journals of Philadelphia and Boston. It is bare justice for me to add that I have generally found them to be of such merit that I greatly regretted that the Academy could not have had the credit of their first publication.

The papers which have been read at our meetings have been characterized by careful preparation, thorough research, original and often valuable hints as to pathological examinations and therapeutical indications.

Our discussions have been of such excellence that I am quite certain that every one carries away from our meetings either new suggestions or new information, which amply compensate for the evening passed in this Hall.

In a scientific body like this, all discussions should express the results of mature inquiry, and a clear and forcible statement of the reasons which have led to positive practice. In

some papers, the novelty of opinions advocated and the original methods of practice proposed, whether medical or surgical, may be so exclusively a matter of individual experience that all discussion must be necessarily limited at first to inquiries and *à priori* objections, founded on anatomical, physiological, or pathological grounds. Papers of this class should be the subject of a most thorough and searching examination; for they may be either mischievous, and their effect for evil must be effectually exposed, or they may possess positive value which should lead to prompt acceptance and adoption.

To secure such discussion as will represent the most advanced knowledge of the Academy on any special topic, I have at our recent meetings adopted a plan first introduced by Dr. V. P. Gibney. Writers of papers have been requested to send to a few of those whom they knew to have given special attention to their subjects, the points which they would suggest for discussion, printed on a small slip of paper, and especially asking those who held different or opposing views to take part in the discussion. They thus have time to arrange and formulate their knowledge and opinions, and the time of those present at the meeting is not wearily wasted in listening to crude, profitless, and digressive talk.

The reports of the Treasurers of the Academy and of the Board of Trustees have already been before the Academy. While its financial condition is now better than ever before, there still remains much to do. A few weeks since, a Committee of Ways and Means were appointed, of which Dr. Gouverneur M. Smith is the Chairman, to solicit contributions to pay off our only debt, a mortgage of five thousand dollars. They have worked with great zeal and enthusiasm, the Fellows of the Academy have responded with self-sacrificing generosity; the necessary sum has not yet been wholly secured, but the prospect of soon accomplishing this is most encouraging. We particularly need money for preserving our library by book-binding. It will be remembered that last year a generous sum was given for this purpose by a lady, who has in many instances shown that she is as warm a

friend to the Academy, as she is conspicuous for her readiness to aid every good work by munificent support. Many of our Fellows have also most liberally added to the beauty of the Library in this way, and have rendered great service in the preservation of our books in good condition, which otherwise would speedily deteriorate.

I have long contemplated offering some suggestions on the present occasion as to the wisdom of a change in our By-laws relative to the duties and functions of the sections. Only one of the sections, that of Obstetrics and Diseases of Women, has kept up an active organization, done excellent work, and made regular reports to the Academy since my official connection with it. Two or three only of the other sections, have reported their organization, by the election of a Chairman and Secretary; and this has been all. Two have appointed a Fellow to read an original paper before the Academy, one of which, a most valuable paper, was read before us. The other I have never been able to get, and as four years have now passed since that time, I do not think it very probable that it ever will come before the Academy.

The founders of the Academy did not contemplate making these sections independent societies for special work, but as contributing aids to the high aims of the central power. I had proposed to suggest such a modification of Article XVII., Section 2, as would assign to the sections functions similar to those of the Academy of Medicine of Paris. But we have not the time now to consider the details of such a change, and I leave the matter for future consideration by the Academy, and my honored successor.

Neither did the founders of the Academy intend to absorb or concentrate in itself all the scientific work of the profession in this city. The whole spirit of its high aims and purposes indicate that, on the contrary, they desired to stimulate and encourage such work in every feasible direction. I hope the time is not far distant when the Academy will be so well endowed that it may offer to all such societies, as the New York County Medical Society, the Pathological, the Obstetric and the Surgical Societies, and the

youngest of all, which has begun its career with excellent scientific work, the New York County Medical Association, a home for its meetings free from all expense.

Our standing committees have always faithfully discharged their important duties, with one exception, and that is the Committee on Medical Education, which has had little to do, and it has just done this and nothing more.

I may now be permitted to ask if the time has not come, when it should be one of the most important and useful of all of our standing committees, in carrying out one of the objects of the Academy as declared in our Constitution, "the elevation of the standard of medical education." How can this best be accomplished, is the question.

It seems to me that a way is now open for this Committee to do effective work in this direction.

For years the medical profession in all parts of the country have been agitating the question of separating the licensing power to practise medicine from the teaching power.

It is a subject of great importance to the profession, to our medical schools, and equally so to the community. It must be met and settled in a way that will be most effective for good, but this cannot be done at once. There are two ways by which this can be accomplished, but each would require time.

One way involves the division of the profession into contending parties, each most zealous to carry its point, heated controversies which always provoke personal feeling and personal antagonism, an appeal for action of societies, and a struggle for majority votes, not only in medical societies, but in securing legislative action; all of which would undoubtedly affect injuriously our medical colleges and lower the profession in the estimation of the public. Any good secured would be at a great and unnecessary cost. The public cannot understand medical controversies except from what appears on the surface. A "doctor's quarrel" seems to the non-medical community like a fight between drunken men in the dark. The late Mr. Charles Dickens once re-

lated to me a story which he had heard, of how Sidney Smith convulsed with laughter a dinner company at Holland House, by his description of a duel between two doctors. The mode of warfare was croton oil on the tips of their fingers, trying to rub each other's lips.

Now this question is one which belongs to the domain of reason, and let us hope, for the honor of the profession, that hereafter it will be confined to the region of argument, and that in due time it will be settled to the satisfaction of all who are actuated by pure motives and a desire to secure the best results. At the last meeting of the Academy, some resolutions were offered, but by the courteous consent of my friends, the mover and seconder of the resolutions, they were laid on the table for future consideration. I therefore feel that I have now the floor, and venture to throw out a few suggestions as to the other method of meeting this question.

In order that the standpoint from which I look at this subject may be perfectly understood, I will briefly state a few propositions which seem to me common ground upon which we all stand, and from which we must start.

Where charters for medical colleges can be easily obtained from State legislatures, it is a duty which the profession owes to the public as well as to itself, to protect the community from ignorant, unprincipled practitioners of medicine, who not only swindle their victims, but jeopardize health and often sacrifice human life.

This is a matter of great difficulty where each State is an independent sovereignty as to all such laws, where there is no central power to control action, and where personal freedom of opinion and conduct is zealously guarded as to everything which does not interfere with the right of others as regards health and property.

The interests of the medical profession are so closely allied with the medical colleges that what affects detrimentally the one must reciprocally injure the other.

The profession has a perfect right to supervise the methods and exercise a controlling influence over those who by

law are permitted the privilege of giving a diploma which is effectually a license to practise medicine.

All wise legislation must be based on a thorough knowledge of all the conditions which demand special law; it cannot be evolved from the inner consciousness of any one who has only the spirit, the zeal, and the genius of reform, but must be derived from the accumulated wisdom and experience of the past.

Mere examination by a special board who have had no previous training in this direction, no personal acquaintance with the mental characteristics, the habits of study, or the personal conduct of the candidate, would be as unsafe a test for admission to the profession as any objection that can be urged against the present system. Injustice would be done to some, while flippant readiness in reply, which can be easily attained by a quick, bright mind by a few weeks of cramming, without either solid acquirement or sound judgment, would always secure success.

The experience of all countries has demonstrated the necessity of examinations by the teaching faculties, and the wisdom of their assent to a license to practice.

But in all other countries except this, there is an additional protection to the profession and the public by the concurrence of another power.

In the Edinburgh University and in some other medical institutions of Great Britain, this is vested in a special Board of Examiners. In France, this is under the direct control of the government. The Minister of Public Instruction has not only the power of granting or withholding the diploma, but, in addition, even in this so-called republican government, he has the power of retiring any professor whose teaching is not abreast with the times. In Germany also, while the methods vary in different universities, and in different constituent parts of the empire, it is yet under government control, which I believe is always exercised wisely.

Now I offer the suggestion that a committee of judicious, wise, and unprejudiced medical men, which would represent

the best interests of the profession, the medical colleges, and the public, could frame a law, with the aid of competent legal advisers, which would combine the two methods, in accordance with the spirit of our republican institutions and the sentiments of our epoch, and thus save the profession from unfortunate and heated controversies, and from crude, hasty, and ever-changing legislation.

Would not the demands of the most progressive members of the profession be satisfied if the Regents of the University were empowered by law to appoint the Committee on Education of the Academy of Medicine a supervisory Board of Examiners for the medical colleges of this city, whose duty should be to make an annual report, not only as to the examination for diplomas, but other details as to the instruction and education of the student. This committee should be enlarged to the number of the principal departments of instruction, and should serve without pay, for there can be no doubt that the best men in the profession who have the time would esteem it a high honor to serve on such a committee.

For the medical colleges in other parts of the State, there would be no difficulty in devising a method by which the Regents would appoint men for the board of supervisory examiners who would be most satisfactory to all.

None except those who are well acquainted with the facts can appreciate the immense advance which the medical colleges of this city have made within the past quarter of a century in teaching, and the increased facilities for acquiring a thorough education in all departments.

I have also great pleasure in referring to two other schools, the "Polyclinic" and the "Post-Graduate Medical School and Hospital," which have been doing great work for the more thorough medical education of those who have diplomas, and thus necessarily for the "elevation of the profession," within the past three years. I do not believe that one in fifty of the profession of this city have the least conception of what these schools are doing. If I expressed in moderate terms my estimation of the importance and value

of their work to the profession of the country, I should be regarded by many as either carried away by my enthusiasm or prompted by personal considerations, so I will only say, Go and see for yourselves. Medical men who come to this city, and who always keep up their professional interest, should not fail to visit them and see what clinical teaching and clinical opportunities are found here, with all the equipments for their utilization, and they will be well repaid for the time given up for this purpose. This system of special clinical improvement originated in Germany, and nine or ten years ago I seized an opportunity to visit the most prominent of the polyclinics in that country. Undoubtedly they have greatly advanced within this time; but I assert that then none that I visited were either in clinical advantages or clinical teaching on a level with our own at the present time.

I take the liberty of suggesting that it would be a wise and politic movement for the medical colleges of this city, the "New York Polyclinic," and the "New York Post-Graduate Medical School and Hospital," to take the initiative, and invite the Committee on Medical Education of the Academy of Medicine to visit these institutions, study their methods and their equipments, and report the result of their observations to the Academy at its annual meeting in January, 1886.

It must be obvious to all that this great improvement in medical education, far beyond the elementary teaching of former times, implies a corresponding elevation, not merely in the level of the average of the profession, but a still greater growth in the higher standards of medical science and literature.

Thus the inquiry is naturally suggested, What is the future of this Academy, what is to be expected from it, and how is it to be placed on the high plane where it should stand in reference to the profession, not only of this city and this country, but of the world? A wise forecast will early plan to secure a result which it desires to attain.

While our educational institutions are steadily improving

their facilities for training the young men who are about to begin their career, and our Polyclinics and Post-Graduate Schools are more thoroughly preparing them for the higher grades of the profession, such an organization as our Academy of Medicine, in the great metropolis of the country, should be an ultimate centre at which all those who have been long enough at work to find out their individual vocation should have every opportunity to carefully study all the literature of past ages, and make original investigations in every possible field of medical science which can add to its importance. All short of this will be just so far a failure of the true mission of the Academy.

Thus far, which is only a beginning, the Academy has done its duty in bringing together most of the best men of the profession and making them acquainted with the special ability of each, in collecting a most creditable library for consultation, research, and circulation, and in stimulating and bringing out good literary scientific work.

What the Academy requires in the future is:

First. A large fire-proof building, with ample room for a library containing all the medical literature of past and coming times, including:

Second. A large hall for its meetings, and others for smaller societies and committees.

Third. A large room for a museum, illustrating physiological and pathological anthropology, and which should include a craniological series, a pathological series, and a series of sections and dissections illustrating topographical human anatomy, and a comparative anatomy series.

Fourth. An anthropometric laboratory, provided with the best means of measuring human bodies, the facilities, and everything cognate to these subjects, and which should include a set of psychometrical instruments and everything pertaining to the series.

Fifth. A lecture hall, connecting with the laboratory, and fully equipped with apparatus for lectures and demonstrations of all kinds.

Sixth. It should also have a thoroughly educated and

trained pathologist, who should, by means of an adequate salary paid by the Academy, be able to superintend all the scientific work and report on the specimens furnished to him: and also a first-class mechanic, skilled in brass and glass work; and a good practical phonographer.

This is a broad scheme, which will require a very large endowment; but it is my firm conviction that it only outlines the future of the Academy, even if it demands a million of dollars.

The liberality of New York is as boundless as its wealth, when convinced of the worthiness of its object. But large wealth is subjected to perpetual annoyance from solicitations, and to criticism from those who have some pet end to promote, which they deem the most important above all others. This kind of discipline trains wealth to the exercise of discrimination and judgment, and, besides, it has its own convictions as to how its surplus can best be employed.

The position of the possessors or representatives of great wealth in this country is peculiar and anomalous; and the thinking men of this class, and there are many, perfectly comprehend this.

There is no reason to suppose that there will be any exception in this country to the general experience of the world in the past, which is, that those who have but little or no property will always greatly outnumber those of large wealth. The position of the owners of great wealth is at once peculiar and anomalous with us. Heretofore, property has protected itself through its representatives, by monopolizing or controlling the law-making and the law-administering power. With us the condition of affairs, if not actually reversed, has certainly been brought within the possibility, if not the calamity of absolute reversal; inasmuch as through universal suffrage, untrammeled by conditions of property, and absolutely (in theory at least) free elections, the control of all law-making bodies and the appointment of all law administrators, has come to be possible with those "who have not" rather than "to those who have."

Property or its representatives, and more especially the

representatives of very large wealth, are therefore exposed to dangers in the future with us, through arbitrary or destructive legislation, which have not existed or do not now exist in any other country. The possessors of great wealth, in virtue of their superior education and knowledge of the use of methods, may be able to guard themselves in the future, as they have in the past, but this will turn on the fact whether they have a clear perception of the situation, and the sagacity to avail themselves of the two strictly legitimate methods for protection open to them for adoption.

The first of these is to bring to the masses, in whom all political power rests, a full realization of the fact that nothing so undermines the prosperity of a state, or so quickly impoverishes the people, through the arrest of industrial growth, as the impairment or the menace of impairment, of the rights of property.

The second is the demonstration by the possessors of wealth, by liberal contributions to every object that can benefit humanity, relieve suffering, prolong and preserve human life, improve education, aid scientific investigation and promote a higher development of art, that they regard their wealth in a great degree as in the nature of a trust, to be used by them for the benefit of humanity and the elevation of the masses.

Happily we have abundant proof that this view has been adopted by many in this city.

The foundation of the Astor Library and the Cooper Institute are a corroboration of this statement as regards the past. The splendid gift to the College of Physicians and Surgeons by Mr. W. H. Vanderbilt, the munificent endowment of the New York Cancer Hospital by Mr. John Jacob Astor, and the generous and liberal contribution of Mr. Andrew Carnegie for a pathological laboratory in the Bellevue Hospital Medical College, are recent evidences of the correctness of my assertion.

Such noble examples are sure to be emulated by many others in the future.

The wonderful material growth and development of this

country is unparalleled by anything in the history of the past, and they are certain to go on in even more rapid strides for years to come. Its educational and scientific institutions will be placed on a corresponding plane, as compared with other parts of the world, with its industrial, its financial, and its political relations.

There is another point worthy of remark. Men of wealth, in common with other men of intelligence, like those devoted to literature and science, have a desire to be remembered after death. They have a dread of having their names and the record of their lives pass into utter forgetfulness or oblivion. To avoid this, the resting-places of the dead are everywhere crowded with cenotaphs and memorials, and in this country especially, by the erection of some of the most expensive monuments and mausoleums of modern times. They crowd each other in some of our cemeteries to such a degree that they lose all their individuality by their multiplicity; and the names which they are intended to keep alive are forgotten in the comments and criticisms as to the comparative merits of the architect or stone-cutter who has directed them. The frequent question asked is, "How much did it cost?" and the only suggestion is that of vulgar wealth. "Yet all here," to quote from quaint old Sir Thomas Brown, "are but Babel vanities. Time sadly overcometh all things, while her sister Oblivion reclineth somniferous, making puzzles of titanic erections and turning old glories into dreams."

The only lasting monument a man can build for himself is the reputation he makes during life, and the memory of the benefits which he has, in some form or other, conferred on those who live after him.

> "But the good deed through the ages,
> Living in historic pages,
> Ever gleams and grows immortal,
> Unconsumed by moth or rust."

From all these considerations I feel justified in expressing the belief that the ideal of the future of the Academy which I have given, will at no remote period prove to be history.

I hope to live to see it well begun, and I have the strong conviction that some now present will see it in full accomplishment. Some man of wealth, fully comprehending the importance of this Academy, not merely to the profession, but still more to the public, will esteem it a privilege to have his name prefixed to our new hall by furnishing the requisite sum to build it and perfectly equip and support it; others will contribute the necessary amount to give their names to each of the special museums that I have mentioned, and others will place their names on an alcove in the library.

I here crave indulgence for one remark, the only one personal to myself:

I trust this evening will end, on my part, all official connection with any medical societies. The remainder of my life, except the time necessary for bread-winning, will be devoted to putting on record the results of more than forty years of study, observation, and experience, with the hope that this may be of some value to the younger men of the profession, and to doing all in my power to urge forward that future of our Academy which I have anticipated.

I have but a few words to add before introducing my successor.

Some years ago, when elected to a similar honor in another society, I remarked: "Scientific societies seem to be governed in their selection of office-bearers by one of two principles. One is to confer honor on those who, by their contributions to literature and science, have won a right to it. The other is to select such as will most efficiently perform the duties which pertain to the office."

In the election of my successor, the Academy has most happily combined both of these principles. His literary and scientific work have won for him an enviable fame and high distinction equally in this country and in Europe. His ability as a presiding and executive officer has already been successfully tested by his former service as President of the New York County Medical Society, and of the Medical Society of the State of New York. Thus he begins

his career with a prestige which is a promise of great success.

I now have the great pleasure of presenting to him the "loving cup," on which his name has already been engraved, and which is to be transmitted to his successors in turn. It is ornamented with the symbol of friendship and love, and on it is the sentiment engraved, "May peace and love be multiplied unto us."

Some years ago the phrase was very current in the political world, "Let us have peace." It is as wise a sentiment for the medical as for the political world. I sincerely hope that my successor will never have to qualify this with the paradoxical appendix, "Let us have peace, even if we have to fight for it."

INAUGURAL ADDRESS.*

By A. JACOBI, M.D.,

PRESIDENT OF THE ACADEMY.

It has been my privilege to enjoy many professional honors. Whatever favors my colleagues of both city and State could ever dispose of, they have liberally conferred on me at different times. To-night I am called upon to acknowledge my indebtedness and express my thanks to you for an extraordinary proof of your consideration and confidence. I do so from the depths of my heart, my pride in my elevation to the presidency of the New York Academy of Medicine being checked only by the overwhelming sense of the grave responsibility incurred.

In regard to the two highest positions the profession of the city has ever placed me in, I have been both fortunate and embarrassed. For when, some fifteen years ago, I took the chair in the Medical Society of the County of New York, my predecessors were Edmund R. Peaslee and George T. Elliott. The former was erudite, wise, a celebrated specialist, a renowned writer of great weight and force. The latter was bright, quick, versatile, as eloquent as his predecessor, conversant with the literature of his profession, also a good writer, and universally admired and loved for his pleasing manner and thoroughly gracious bearing. The difficulty of presiding after such men was relieved by but one all-important circumstance, which was this, that they

* Delivered before the New York Academy of Medicine, February 5th, 1885.

had raised the Society to a flourishing condition such as had never existed before.

Now, as concerns the presidency in this Academy of Medicine, I believe I am in nearly the same position. If I were more eloquent I should try to do justice to the president of so many years, in recalling his services in the interest of the literature of medicine, of the standing of the profession at large, and of the development of this Academy. To say that the medical world knows him well, that we, the profession of the city, and the members of the Academy, are under a great and respectful obligation to him for his untiring care and energy, his enduring patience, his kindness and urbanity, and his uniform success in conducting the affairs of the Academy, is but an incompetent expression of my feelings. Personally, I add my extreme gratification at the fact that it was under his guidance and supervision that the Academy could overcome such dangers and strifes as I hope these walls will never behold again. As they, however, are things of the past, I hope I shall have nothing to do but to preside over harmonious scientific meetings only, such as were contemplated when the Academy was founded. It will be my ambition and pride to contribute to its success as much as I can, hoping at the same time, that your expectations will not be measured by Dr. Barker's eulogistic remarks, which I should be glad to deserve. In regard to them I will only say that I believe they were made on the principle and for the reason, that it is wise to stimulate ambition into powerful efforts for the accomplishment of ends by praising beforehand. The members present I beg again to receive my thanks, my promises, and my request that every one may consider the interests of this Academy under his personal charge. It will then be an easy task not only to preserve its high character, but in the course of time make it the largest and most influential scientific institution in the country.

How this can be accomplished has engaged my thoughts more than once. For the New York Academy of Medicine has been established for more than one purpose:

First.—The cultivation of the science of medicine.

Second.—The advancement of the character and honor of the profession.

Third.—The elevation of the standard of medical education.

Fourth.—The promotion of public health.

It has not been founded upon the plans of European institutions bearing similar names. The academies of sciences or of medicine in Europe, established for the promotion of the science and art of medicine, are institutions with a limited number of members, who have peculiar claims for such distinction. In them we find the most representative men only. Every one is a specialist in his way, a teacher, a savant; most of them are men of reputations, many are celebrities. They are professors in universities, directors of clinical institutes, independent of pecuniary compulsion to practise medicine, enjoying the leisure required for studies of their own. They are governed in part by rules prescribed by the government, which pays for their services either rendered to a public institution or to pure science.

Our Academy is a democratic institution. It is not limited in numbers—on the contrary it is desirable that the many respectable physicians should gather round its flag. Like our political community, it looks for its development and success in the co-operation of the competent and cultured masses. Like the Union, it is a voluntary confederation of peers, who make their own laws, and obey them because they are of their own making. The members have the same interest, both scientific and professional. There are but very few of us who are not engaged in the practice of medicine. When the Academy was founded, the members were, all of them, general practitioners: specialists there were but few. This has changed much; both study and practice have tried to become more profound by circumscribing and limiting their aims. But all of us are active men, not tied down or given up to study only. Thus we perform less laboratory work than they do in Europe, and write fewer monographs on special subjects. But the number of facts closely ob-

served at the sick-bed or in the examining-room has increased from year to year. In spite of the circumstance that we are all busy men, the literature of medicine in New York and the United States is no longer mostly parasitical, as Oliver Wendell Holmes was justified in complaining during the session of the second meeting of the American Medical Association. Original work has taken the place, in part, of translations and reprints; still all the time the connection between the medical men and the public, the doctor and the patient, has not been severed. This is the peculiar feature of American, as it is of British, medicine. Anglo-Saxon medicine has never forgotten that the aim and end of all medical science is the treatment and healing of the sick, and that every special study is but a means to obtain that end.

Thus our Academy is not to be the centre of a select few, who speak to the rest of mankind through their writings only, but of all who love their science and live the lives of respectable practitioners. All ought to be members. I have often been told, however, that the large number of societies prevents men from becoming members in the old and large ones. That is so. There is too much division and subdivision. But that is not the fault of the Academy. Under other circumstances the Obstetrical Society might well have been a section of the Academy; the laryngologists, otologists, ophthalmologists, dermatologists, might have their own sections under the auspices of the Academy, though under their own rules, their own officers, and, while doing the same amount of good work, not lose their connection with the main body. The large societies, such as the Academy, or the American Medical Association, or the German Association of Physicians and Naturalists, lose by the secession of important branches and their representatives. The unity of medicine is lost sight of, and the interests of science and the profession are suffering. Instead of one or two, every section of this Academy ought to be flourishing. Let us hope they will. We have been told tonight that there was more than an abundance of papers

offered. Our rooms they are welcome to. Though we have to think of some time increasing our facilities, we can still accommodate them, and others besides. Indeed, most of the medical societies of the city would do well to avail themselves of the home the medical profession of the city have found in this hall, and meet here.

The peculiar features of this Academy I have mentioned permit of varied results. The mixture of the best brains of the profession and the modest practitioner is capable of raising the standard of the average professional man far beyond the level of the European medical man, frequently in knowledge, always in industry and ambition and ethics, without interfering with the individual and original labor of the hardest workers and best thinkers. Have we been successful on this side of the Atlantic?

They say we have no John Hunter. All Great Britain, in all its pride, has but one. No Bichat or Laennec. All the glory and elegance of France have but one. No Virchow. All the centuries of toiling and philosophical Germany have produced but one. What we do have, however, is a medical profession with unbiassed minds, clear insight, critical eyes, undaunted industry, and that republican courtesy which recognizes—*suum cuique*—the peculiar advantages and services everywhere, and the democratic tendency of appreciating, and appropriating, the intellectual accomplishments of the globe, and of utilizing them for the practical necessities of the commonwealth.

Besides, we do not live in the backwoods, or in the darkness. As long as the Confederation and the Union have been in existence, their medical men have been, to say the least, marching in line. In what the Anglo-Saxons have known and taught, they have both participated and co-operated. Without the counting in of the original American contributions to science, the history of modern medicine would be incomplete indeed. Let Europe boast of their great names: this young community has the heirloom of the great names of Bard, Rush, McDowell, Drake, Beck, and many others of *past* years. Let the history of this

Academy be written—and a grateful and gratifying labor it would be—and the array of great names is such as to astonish many of the young men in this room, who unconsciously and unconcernedly toil over the graves on which are inscribed the names of men great in literature, or achievements, or influence, great in mind and character. Let me mention a few of those who have passed away. I have known personally, and conversed and discussed with, John O. Batchelder, George M. Beard, Gunning S. Bedford, Ch. A. Budd, Gurdon Buck, H. D. Bulkley, William H. Van Buren, Freeman J. Bumstead, Henry G. Cox, George T. Elliott, John W. Francis, Edward Delafield, Elisha Harris, Horace Green, Ernst Krackowizer, Valentine Mott, Josiah Clark Nott, Edmund R. Peaslee, Willard Parker, J. Marion Sims, Joseph M. Smith, Alexander H. Stephens, James Stewart, John Watson, Robert Watts, Isaac Wood, James R. Wood. Many of these names are known wherever medicine is taught and practised; some of them will never die. This Academy will always cherish the names of its members who contributed to the glory of universal medicine and the American country.

When I, and those as old as I, knew these men, most of them were in advanced years. At that time the proportion of white heads was very much larger than it is to-day. I venture to say that it was for the good of the Academy that that was so. Neither the political republic nor that of science can thrive without the co-operation of all. At that time the number of older and old men was such as to draw forth sometimes the remark of some class of young men that the Academy was the headquarters of old fogies, and for that reason might be avoided and shunned. Much has been changed in this respect. Curly heads and young faces are plentiful, a good sign indeed for the energy and activeness of the growing generation. Many white beards, however, and bald heads have commenced to stay away for years, a proof indeed of the increased claim on their time and strength, but we fear also, now and then, of listlessness and indifference.

This ought not to be so. Neither in politics nor in science does age extinguish citizenship, with its rights and duties. Besides, I know that the best trained young minds are modest enough to admit that they are able and anxious to learn from those whose opportunities extend over a long number of years, and that books, brains, and experience are a greater power than books, brains, and inexperience.

These remarks I make for the purpose of requesting the older members of the profession not to withhold their presence and aid. Among them are men widely known in both hemispheres. When they write everyone reads, both here and in Europe. Let them not forget that a vast audience is just as anxious to hang on their lips when they either lecture before us, or take part in a discussion. They owe their teaching and their example to the rising generation of our younger brethren. They will teach them both medicine and modesty. May nobody who neglects his own duty toward them and the profession at large accuse a young man of forwardness. Some of them have indeed reaped a good harvest from living up to their duties as citizens of our republic of science. For if there be a fountain of youth for old men, it is the constant mixing and working with the young. The Nestor of our surgeons, whose face we greet with joy in almost every meeting, and whose voice we are delighted in hearing in our discussions, proves better than any preaching the powerlessness of so-called old age.

The hosts of others, general practitioners and surgeons and specialists, whom we like to boast of and to honor, will always be welcomed by all of us, both old and young, to seats in the front ranks. If they will consent, not only our scientific but also our public aims will be more apt to be reached.

For our position is that of the natural advisers in all matters concerning sanitation and health. The larger the number of our members, the more we represent the best minds and all ages in the profession, the more readily the public and its legislators will listen to us. When they know that our advice will be the digest of the best knowledge and the

ripe wisdom of the profession, they will not wait until it is forced upon them. In matters of health the two large medical societies of the city ought to be, will be, the authorities. If that be so, it will no longer depend upon a number of ladies only to remove intolerable nuisances from the heart of the city. The simple appeal of the profession will become the protection of the public. The latter will soon learn that it can rely on your knowledge and public spirit, and as it calls on the bar for legal advice, it will consult the medical profession for sanitary necessities. In this way it will happen that some time the President of the Board of Health will be nominated, or appointed by the profession; that no Board of Education, no Board of Charities will be complete without a prominent medical member; medical bills will pass the Legislature, when backed by the whole power of the profession, without either delay or mutilation; the supervising officers of factories, nurseries, streets, baths, gas-houses, will be physicians; aye, the most improbable thing will happen, which is this: that the public will acknowledge that the government of hospitals ought not to be without medical advisers in their boards. In order, however, to accomplish such results, we must unite our numbers, powers, and influence. The public and legislatures will respect and obey the regular medical profession more eagerly than the advice of individuals or societies. It gives me great pleasure, in this connection, to be able to announce to you that the representatives of the profession of the State agreed but yesterday on a bill to be presented to the Legislature, ordering a Board of State Examiners destined to license the practice of medicine. The unanimity of action in this respect on the part of apparently diverging and conflicting interests is a good omen, in this progressive State, for the growing influence of the medical profession. Thus far the State Medical Society has done its part of the work nobly; now, may everybody see to it that the Legislature of the State be kept well informed and well advised.

The practical tendency of this Academy corresponds with the peculiar nature of the development of medicine in the

English-speaking nations from the last century onward. Even the most fragmentary study of that development is of great interest indeed. Altogether, medicine in the eighteenth century exhibits a peculiar character. It is true that knowledge was not widespread, but the heads of the profession were capable, painstaking, searching, cool-headed men, good observers, and excellent describers. There was a large number of good monographs, excellent histories of cases, and fair diagnoses of the general condition of the patient. Local diagnosis, it is true, was mostly out of the question, since no sooner than in the second half of that century Morgagni collected in his illustrious work, "De Causis et Sedibus Morborum," all of the only three thousand post-mortem examinations which had ever been recorded in all ages and countries. Their judgment was sound, their therapeutics—though often exuberant—safe. As the scientific language of most of them was the same, Latin, their spirit was not local nor national. The same class of men were found in Germany and the British possessions; also in Holland and France. In the former we meet the names of Werlhoff, R. A. Vogel, Zimmermann, Lentin, Van Swieten, J. P. Frank. There was also Auenbrugger, who ought not to have been so readily forgotten. In Great Britain there were Mead, Huxham, Fothergill, Pringle, Heberden, Monroe, Home, Cullen; there was that giant John Hunter. In America we had Bard and Rush. In France, Levret. In Holland, at an early date, Boerhaave. The only fanatical theorist of all the English writers was John Brown; the only obscurist, who ought to have had a place in Germany between 1800 and 1840, was Robert Jones, with his "Inquiry into the State of Medicine on the Principles of Inductive Philosophy" (1782). When Broussais reigned supreme in France, his doctrines were welcomed by a great many in England. But the Anglo-Saxon mind is not easily drawn away by theories, and there is after all more solid work in Broussais than wanton theory only. Thus the English literature of the early part of this century teems with good observations and monographs by many more

than those I here mention—Travers, Williams, Crawford, Astley Cooper, Brodie, Bell, Abercrombie, Cheyne, Pitcairn, Bright, Hope, and Carswell.

Of French names I have mentioned but one.

The redemption of France, after a century of almost unparalleled corruption and misery, begins with its great Revolution. Never before did fate grant to an unhappy nation a larger number of great spirits, both in politics and science. The faint impression the freer institutions of the British Island made on French literature would not have influenced the development of the country for centuries to the same extent as did the necessities of the population. In the history of political and mental development changes more or less sudden or gradual appear to be the rule; rise and decline change off, as the fertility and sterility of a corn-field. The fertility of France lasted a long time. While the greatest man in its political world could not do better than spread all over Europe part of the results of the French Revolution through violence and murder, a young scientist revolutionized medical science by genius and hard work. That is what Bichat did when he studied the physiology and pathology of the organic tissues. Since that period, France has marched at the head of medical science for about half a century. Pinel, Corvisart, Cruveilhier, Biett, Cazenave, Gibert, Laennec, Ricord, Civiale, Guérin, Guislain, Baillarger, Leuret, Longet, Guersant, Taupin, Valleix, Legendre, Dupuytren, Trousseau, Rilliet, Barthez, Durant-Fardel, Orfila, Louis, Broussais, Piorry, what a host of illustrious names, and by far not the only ones who will recall the glory of the French nation when there will be no longer a political France. It is true that a decline has set in. The number of really great men in modern French medicine is but limited. Charcot's name overshadows the reputations of all others, and it appears to me will live for centuries. May be also that Pasteur will be recognized as a fixed star in the scientific sky if he will succeed in divesting himself of the doubtful attributes of polemical tendencies.

After Bichat there are three French names connected

with the history of medical sciences in all countries. Laennec's revolution of diagnosis by percussion and auscultation, is not any the less important and precious because Auenbrugger had worked in the same field more than half a century previously, for no other purpose but complete oblivion. Magendie's experimental physiology and pharmacology has benefited all mankind. His is the introduction of alkaloids, such as quinine, veratrine, strychnine, piperine, morphine, emetine—his the successful admission of bromine and iodine into practical therapeutics. Finally Broussais, by overthrowing ontologies—though he created one of his own—by localizing disease, by urging prevention and abortive treatment, by studying the anatomical lesions of pathological processes, has substituted a method of anatomical thought in diagnosis for the merely clinical and empirical observation of the sick, and thus been the intellectual author of that method of medical knowledge and reasoning which is best known by the name of the Vienna school. I shall have to consider its representatives shortly, with all its virtues and faults, both of which were learned and loaned from the illustrious Frenchman. For not only did he convey to them his anatomical way of thinking, but he also taught them to be satisfied with coarse local anatomical lesions, and with a nominal diagnosis, adding the assurance that those lesions must lead to death; that indeed the case is either getting well spontaneously, or is absolutely hopeless, and that a treatment of any kind is powerless.

The parallelism of political and scientific conditions which strikes us so admirably in the history of French development, after the impulse given by the Revolution, is sadly illustrated by poor Germany. The country poor and forlorn, divided in hundreds of shreds, large and small, tyrannized and robbed by hundreds of dukes and bishops, and princelings of all sorts, every one the inferior in mind, but the emulating admirer of the tendencies of that despotic Frederick the Second of Prussia, in whom it requires the equally despotic soul of a Carlyle to find nothing but admirable traits; that country had, about the end of the eighteenth cen-

tury, one representative in medicine corresponding with the character of the time. Hufeland was a fair observer, a copious writer, an influential man, but weak and accessible to everybody and everything. It was he who admitted the first Hahnemannian gospels to his journal, and who was of the wise opinion that there may be something good in everything. Then came the French, and whipped the Germans out of political existence. Then the wars which expelled the French, bloody, costly, and short, aroused a peculiar romantic fanaticism which pervaded the whole literature of a short decade, and could but have an unfavorable influence on science. Then came decennia of brutal political reaction and suppression, the scanty means of the nation being spent on police, military, and dungeons, in which the flower of the country, and particularly of the universities, was incarcerated. During that time German thought had no place in terrestrial parts; even before that time Schiller had proclaimed man "free though he wore chains." This sort of freedom the Germans utilized to become transcendentalists. The principal method of studying nature was imagination. Even Kant, the mathematical thinker, had taught them the art of construing things *à priori*. Then came Schelling with his system of natural philosophy, and Hegel, who wrote twenty big volumes, and is reported to have said on his death-bed, that in all his life he had but one pupil who understood him, and that one did not know anything about him. Under the influence of these philosophical absurdities no medical science could thrive. That was the time of animal magnetism and granioscopical humbug.

In such a condition of universal intellectual semi-paralysis and revelry in big words and clouded sensations of all kinds, combined with the insensate and murderous character of therapeutics, it was natural that homœopathy could thrive, with its axioms, that disease was an enemy from without, the result of psora or of medicines; that nature was an enemy of man; that nature will not cure a disease but a medicine will; that no medicine will cure which can be shown by any physical or chemical analysis to still exist;

that its dynamical power increases with its attenuation and annihilation. That was the time in which one of the great lights of German medicine defined inflammation as the condition in which the "electrical essence (or part) is affected in the dimensions." Marcus never said that he understood that himself. At that time the medical literature of Germany was full of such philosophizing nonsense; full of contempt of the unphilosophical foreign countries; of Bright, with his British coarseness in studying nature as it was; of Laennec, whose percussion and auscultation were declared to be immoral and irreligious. My beloved teacher, Professor Fred Nasse, though all his life a believer in and author on animal magnetism, was one of the first to utilize Laennec's great innovation and the lessons of foreign teaching. Even Schoenlein, though it was he through whose influence young Virchow, after he had been expelled from Berlin for his liberal political views, was called to Würtzburg to teach pathological anatomy, could not free himself from the influence of philosophical doctrines. At that time the science of therapeutics consisted indeed in nothing but empty words, its practice in a great part in the traditional blood-letting, salivation, and purging. Thus it was that the fanatical hydropathists, and the adversaries of vaccination could obtain such rare opportunities and successes; thus that, but forty years ago, Rademacher could divide all ailments into saltpetre, copper, and iron diseases, by reason of the remedies of which each cured one-third of all the ailments of German kind.

Schoenlein and Liebig having prepared the medical minds, and the influence of foreign literatures being gradually felt in Germany and Austria, it so happened that Vienna had in its faculty of medicine quite an array of medical genius. Rokitansky, Skoda, Hebra, have long reigned supreme. Broussais' doctrines, good and bad, were readily accepted; his ontological gastro-enteritis was replaced by Rokitansky's doctrine of the crases of the blood, thus re-establishing the old humoral theory on an apparently firmer foundation. In Rokitansky's opinion the anatomical changes were the only

thing in medicine worth knowing. Skoda, for some time, experimented carelessly and unsuccessfully with remedies; his ill-success and Rokitansky's teaching confirmed the nihilism of Broussais, against which Laennec protested in France, and made the expectative treatment and the nihilistic faith the gospel of German practice.

> "This was the medicine—the patients' woes soon ended,
> And none demanded: Who got well?
> Thus we, our hellish boluses compounding,
> Among these vales and hills surrounding,
> Worse than the pestilence have passed.
> Thousands were done to death from poison of my giving;
> And I must hear by all the living
> The shameless murderers praised at last."

But in Goethe's "Faust" this is said by an incorrigible philosophical roué, who is ready to give himself up to the devil, and in Germany it had the result that the public, who have a right to desire to be cured when they fall sick, preferred the homœopathic pill-box to the pathologist's post-mortem case.

Not long after, Oppolzer, whose name ought to be blessed forever in Prague, Leipzic, and Vienna, began his influential career. In him Germany possessed its first great physician in this century, who knew pathological anatomy perfectly, was a thorough diagnostician, a humane physician and amiable teacher, who recognized the social, scientific, and humane duties of the practitioner, abhorred preconceived ideas and *à priori* constructions, acknowledged principles and facts only, and no duty but to find the truth.

It was about that time that Rudolf Virchow commenced to revolutionize medicine. Modern medical science owes its solid foundation and elaboration to him and his followers. The book of medicine of to-day, and, I trust, of the future, bears the imprint of his genius on every page. We all have read, and admired, and praised, knowing that when we readily place Germany in the first rank of the medical world to-day, the name of Virchow is in every mind and on every lip. This brief sketch cannot do him justice, nor do I desire to elaborate a theme with which every one is familiar.

But one remark I cannot suppress, viz.: that he is not only great in his revolutionary discoveries and innovations, but in his self-denying conservatism also. If the bacteriomania of modern time has not been accepted uniformly as the universal gospel of modern pathology, if thoughtful hesitation and healthy criticism is still heard above the noisy waves of the seas of all-explaining and all-saving theories which claim to have given, at last, an absolutely solid base to etiology and pathology, that merit again belongs to a great extent to Virchow. I speak of it here because I hope that this Academy may be able to contribute to the solution of questions of great import, by original studies and discoveries.

For there was lately a time, or rather we still live in that time, when a single series of discoveries lays claim to having changed the aspect of pathology at one stroke, and solved all problems. You know I speak of bacteriology. In America also, all of those who cannot judge of the question by their own investigations, that is, the practitioners, either general or special, have readily accepted the new gospel with but few exceptions. The new theories, that infectious and zymotic diseases have each their own bacillus, are so pleasant and promised to be so fruitful that it required some courage to critically resist the flood. On the other hand, those amongst us who have a right by their own researches and special knowledge to be heard, have hesitated to accept the results of microscopical, actual or alleged, discoveries as the sole explanation of everything infectious and zymotic. Amongst them I shall only name Wood and Formad, and Sternberg. Into the merits of the case, and the weighing of reasons I cannot go this evening, but it has appeared to me that it would be well to direct the attention of the Academy to that subject as one greatly deserving of its attention.

To me, while I readily acknowledge a valuable increase of pathological knowledge, and the fact that the spreading of some diseases at least, slow, and gradual, and regular, seems to prove the multiplication of cases of disease by the regular multiplying of its causes, it has always appeared that purely

bacteric etiology has too often begged the question, and that the answer to the question, whether organic or chemical poisons are the main causes of infectious diseases, has, by no means, been satisfactorily given. In the course of the last dozen years organic chemistry has made as rapid strides as has microscopy. Cadaveric poisons, ptomaines, have been discovered in great numbers. Most of them are very destructive. Sudden deaths from zymotic and infectious diseases resemble much those produced by these poisons. That the stings of insects or the poison engendered in putrid corpses lead to speedy destruction has always been known. The symptoms are exactly like those produced by many known poisons. Forensic medicine has a great many instances already in which it could be proven that the poison extracted from the body of the dead was not a vegetable agent, introduced during life, but the cadaveric poison. Count Gibbone was said to have been murdered with delphinine. Professor Selmi proved that what was claimed to be that vegetable poison was cadaveric. In another case he saved the life of a suspected person by proving that it was not morphine, but ptomaine which was found in the body. Besides the poisons named there is strychnine, colchicine, atropine, coniine, woorara, nicotine, veratine, hyoscyamine, narceline, the symptoms and chemical reaction of which are the same, or almost so, as the cadaveric poisons. Lecithine is found in putrid fish; a very dangerous chemical poison has been extracted from putrefying Indian corn and rye. Thus it is that many cases of poisoning with cheese, meat, fish, sausage, jelly, and yeast, many of them resembling acute infectious fevers, may find, and indeed have found, their ready explanation.

Brieger found quite a number of different varieties of cadaveric poisons—neuridine, neurine, muscarine, æthylendiamine, gadinine, and others. Many of these destroy life in a short time, and with the symptoms of acute infectious diseases. These poisons are found, in many instances, in the fresh dead body, not in that one which has undergone complete putrefaction. The results of putrefaction will,

after a while, change entirely and become rather wholesome than injurious. Many years ago, Salkowski examined a vessel full of ascitic fluid, which he knew to be in utter putrefaction when he last inspected it. Not only was there no putrefaction any more, but, on the contrary, chemical decomposition had formed phenol. Thus putrefaction had worked its own destruction and antidote. The inference, then, is that a poison, even in the course of the same disease, may not always be found.*

Ptomaines are often met with in the presence of bacteria. Is it the latter which produce them? Do they so decompose the albumen of the tissue that a ptomaine must or can develop? Or is it their own vital change which produces it? Most modern writers—not chemists—believe it. But if the cause of decomposition of the living or dead be not bacteria, but a chemical poison after all, is it necessary to assume that the poison cannot form except through and with the presence of bacteria? And is the bacterium the only poison? or the only source of the poison?

If deadly poison, such as we know to destroy life suddenly, or almost suddenly, and of such virulence as is reported in what was formerly believed to be legendary only, but which may be historical, will almost invariably originate in the dead body, is it so impossible that it may develop in the still living under certain circumstances? Have we not had enough yet of the monthly instalments of new bacilli which are the invariably correct and positive sources of a disease, and replaced by the next man who comes along? Have we not yet enough of the statements, that, as for instance

* Would it be so impossible to judge that the bacterium is an accompaniment of a chemical poison and may be present, or absent, according to the changed condition of the poison? Such changes take place all the time in putrefying material, as Salkowski has shown, and others after him. They probably take place in the living body also, during infectious fevers. In the incubation they develop, they are most poisonous and vehement during the height of the process, they gradually change into less dangerous combinations, into an indifferent state, and finally a really disinfectant material. Thus it may be that the floating poison may become even beneficial. Is it for that reason that patients who have outlived a serious attack of typhoid fever, are endowed with better nutrition and more vigor afterward than they ever enjoyed before?

several bacilli are claimed each to be the only cause of diphtheria, by several observers, that there may be several distinct bacilli every one of which can produce the same scourge? Is it not just as safe to still presume, that, when several forms of bacilli are believed to be such sole causes, that the real cause is in neither?

Exactly so, neither in one nor in the other, notwithstanding it all appeared settled. For our journals are replete with the very latest authentic bacterium of diphtheria. This time it is neither Klebs nor Eberth, but Loeffler. Reports, discussions, and even editorials carry his name over the world. The very nature of diphtheria is said to be revealed again, as several times before; still, the discoverer admits that there are cases without the bacterium.

The matter is becoming ludicrous. I begin to fear something like the recent rebellion against piano-playing in a large European city. Is not music a godly art, and the piano a blessing to the musician? But the playing of fifty thousand beginners in a large city is a nuisance. When bacterio-microscopy in the hands of beginners becomes noisy like piano-playing—noisy in books, pamphlets, and journals—a gentle protest is permissible. That protest is not meant for the masters who know how to wait and to mature. I do not speak against Robert Koch and his peers, who all of them are more modest than their followers. When the kings build, the cartmen are kept busy—and boisterous.

A dozen years ago the coccus of whooping-cough was said to be discovered. There was no doubt about it. There was whooping-cough, there was a coccus; what was plainer and more conclusive? To cure whooping-cough, nothing is required but to kill the coccus. Quinine will kill a coccus, quinine cures whooping-cough. Since that time there is no more whooping-cough in existence; or, if a case would be malevolent enough to turn up, it could not last longer than until a few whiffs of quinine can reach it. That is ludicrous, is it not? But it was preached like gospel, and it was believed. Many more such have turned up, and will turn up, for coming years to smile at.

There is a peculiar feature in this bacteriomania. Its principal impetus it received in Germany at a time when great changes had taken place in its political and financial affairs. All at once there was an Empire, of which historians so much spoke, youth so much dreamed, romancers so much fabulated. All at once, at the same time and a decade before, an unusual industriousness, commerce, enterprise, and unwonted wealth, and still more expectations than wealth; all at once an influx of five thousand millions of francs, not earned by honest work, but conquered by war, which could not but turn the poor heads and unstable the solid foundations of regular development. From that time dates that lack of safety and steadiness in German financial circles. They have even invented a name for that period of swindling, "gründerthum." Speculation was rife—fortunes were made in a day from nothing but self-assertion and daring and lost as quickly.

The moral and intellectual atmosphere created by these tendencies is never breathed by one class of people only. If self-assertion can make a fortune in finance, why not in science? If a reputation may perhaps be made by a stroke of chance, why not try that chance? Speculation was rife. Any young man can look through a microscope—perhaps he will draw the prize in the lottery of alleged science. Looking would be all right, if he would not write. Medical life would be easier if there were less journal articles containing the latest infallible discoveries. Thus it has come to pass that German medicine has a two-fold aspect nowadays. The days of her superiority are not over yet; her greatest men still live, and the toiling thinkers are at work, but the number of speculators is immense. A great many of the articles printed in the journals of the last ten years have been prematurely published, the number of preliminary notices announcing discoveries under way is very large. The great embryo cannot wait. He is afraid of having his celebrity snatched away from him by the next-door microscopist.

Thus it is that we often find a difficulty in keeping our eye on the great lights, whose rays are always welcome. If

learned and thoughtful specialism has its justification anywhere, its field is the solution of the mooted questions alluded to. Thus far I claim, however, that in regard to bacteriology, the main questions are before the medical world still. I firmly hope the Academy will prove the centre of critical researches by which the problem, whether bacteric or chemical poison, still a mystery, will be carried nearer its solution.

In this expectation I am justified by a reference to the historical fragments you permitted me to sketch to-night. There has been no deviation from the empirical and clinical tendency of Anglo-Saxon medicine from the beginning. It was so strong that it gave character to the medicine of the eighteenth century. In the words of the Testament I might say, Sydenham begot Boerhaave, Boerhaave begot van Swieten, van Swieten begot John Peter Frank. Sydenham and his generation of followers are the flower of the whole century, and their spirit penetrates everywhere. In those times the senses alone were the diagnostic apparatus. The exact methods of the following decades have sharpened the senses of the English and American medical men, and render their observations more accurate and their results more correct. Live and learn has been their pass-word. No new methods have ever been neglected, only unfounded theories ought not to find root in the regular medical profession. As the best features of all experience and wisdom of all ages and all nations have been utilized in the establishment of our political system, thus the American medical mind has received, appropriated, and critically digested the results of foreign scientific labor and added of its own. It is with sincere pleasure that I have again read that interesting collective volume containing a century of American medical history. In it those of you who have not read it will find many a good reason to be proud of the achievements of our country. It is so modest in its tone and contents that many more names might have appeared in the enumeration of men and labors, not to speak of those who have added materially to our wealth of intellectual produc-

tions since. Its perusal will be a revelation to many who are in the habit of looking for everything new and trustworthy, and—that is the technical term now-a-days—epoch-making, from abroad. If there is anything which teaches us both justifiable pride and desirable modesty, it is the history of our science in our whole country. For besides a great many of the former and present members of this Academy who have accomplished lasting results, there are a great many otheı Americans in other states and cities who stand on a level with the best of all nations.

From the reading of old journals I learned but lately that four years before Semmelweiss proclaimed the contagious character of puerperal fever, against the protest of the official standard-bearers of obstetrics in Austria and Germany, our own anatomist, our philosopher, our poet, our autocrat, our own Oliver Wendell Holmes, taught, it is true, against the ridiculing sneers of Hodge and Meigs, the frequent transmission of puerperal fever by physicians and nurses. I might go on a long time, but I do not stand here to extol America or American medicine. Still I feel strongly that we may be well satisfied with what we, not protected by governmental interference, unaided by a slow growth through centuries, have accomplished in a proportionally short time. The last few decennia gave us the library of the Surgeon-General's office, the "Subject Catalogue," "The Medical and Surgical History of the War," standard books, recognized as such in Europe, great journals, and a goodly array of valuable monographs, and vastly improved college education; they have raised great surgeons and clinicians of universal reputation, and a progressive profession whose aim and best efforts are directed toward the improvement of medical training, and the sanitary condition of the people.

All this I firmly believe is true. If it were not, let us make it so. If it be, let us still rise and work, and with all that, let every man among us feel what Holmes said forty years ago: "I am too much in earnest for either humility or vanity."

AN OPEN LETTER.

At the close of Dr. Jacobi's address, Dr. Chadwick presented a photograph of Oliver Wendell Holmes, accompanied by the following letter addressed to Dr. Barker:

Boston, February 4, 1885.

MY DEAR DR. BARKER: You must allow me to join my best wishes to those of the friends who will surround you as you take leave of the office which you have filled so ably and happily.

I trust that you have not forgotten the day when you were with us at the opening of our Boston Medical Library. I know full well that we remember your presence, and how much it added to the pleasure of the occasion. Our Library Association, I hardly need tell you, has proved eminently successful—I want to say because you smiled upon its birth, but I dare not, for you have smiled upon a great many births, not every one of which, perhaps, has had the good fortune of the infant institution which you joined us in welcoming.

You may have learned some of our secrets during that visit—who knows? There are sparks of intelligence still left among us. At any rate, ever since you left Boston we have kept an eye upon you. As soon as it was learned that you had been spending some little time here, you were made President of the New York Academy of Medicine. As soon as you got back, for *some* reason, the Academy took a new start and has been flourishing ever since. All my informants agree about the fact, and they add that it is due to your own faithful administration and energetic efforts.

We of Boston congratulate our brethren of New York that they have had the great advantage of your services during these last eventful years. The gratitude of the medical profession will keep alive the memory of its benefactors. We must trust the future for its *vis a fronte*, but in the broadest and loftiest period of progress the leaders will look back to the days of up-hill work when you, our honored

friend, lent all your vigor to that *vis a tergo* which they will feel pressing them forward to larger and higher achievements.

Pardon me for addressing this open letter to you. You can retire "to blush unseen," while some friend is reading it, if it is thought worthy of that honor.

Always faithfully yours,

OLIVER WENDELL HOLMES.

To FORDYCE BARKER, M.D.,
President of the New York Academy of Medicine.

ELECTRICITY AS A STIMULANT IN RESPIRATORY AND CARDIAC FAILURE.*

By GASPAR GRISWOLD, M.D., M.R.C.S.

ELECTRICITY has long been conspicuous among the agents recommended for the treatment of sudden prostration, attended with respiratory and cardiac failure. The text-books, in discussing the resuscitation of cases of poisoning with such drugs as chloroform and opium, always include the faradaic current as a stimulant in the same clause with ammonia and alcohol; and every doctor feels it a duty to keep a battery in good order, that he may have it to use in such an emergency. It will be the object of this paper to inquire how far the usual methods of applying electricity in cases of collapse are in accord with what is known concerning the physiology of the heart. Electricity will be spoken of in a general sense, including both galvanic and faradaic currents; in this connection there is no important difference between the action of the two currents beyond the fact that the galvanic is more powerful. In a general way, however, the faradaic current is referred to, being the one far more commonly used in emergencies. A galvanic battery, in good working order, at hand in an emergency, is one of the rarities of medical experience.

Taking into consideration, first, the use of electricity as a stimulant in cardiac failure, the question naturally presents itself, Can electricity be so applied clinically as to stimulate

* Read before the New York Academy of Medicine, February 19, 1885.

the heart? To answer this question, let us turn for a moment to a short synopsis of the cardiac mechanism. The muscular contractions which constitute the heart-beat are the result of impulses generated by nerve structures situated in the substance of the heart itself. After all the nerves going to it have been cut, and even after it has been removed from the body, the heart still continues to beat.

The pneumogastric nerves exercise an inhibitory influence upon the heart, and modify its action principally by determining the duration of the period of diastole. A mild faradaic current, applied to one or both pneumogastrics, slows the heart by prolonging the diastole, the duration of systole not being visibly affected. A stronger, though still moderate, current slows the heart more conspicuously, prolonging diastole until the heart seems to hesitate whether to beat again; this amount of pneumogastric stimulation disturbs the heart's action sufficiently to considerably retard the circulation. A decidedly strong current paralyzes the heart muscle, and causes permanent arrest in diastole.

Under the name of "accelerator nerves of the heart" physiologists have described some branches from the last cervical and first thoracic sympathetic ganglia, going to the cardiac plexus. Electric stimulation of these "accelerator nerves" causes a quickening of the heart's beat; in this quickening, however, what is gained in rate is lost in force, for the blood-pressure not only is not raised, but may even fall during the stimulation. Indeed, the acceleration of the heart produced by stimulating these nerves closely resembles the quickened pulse of asthenic fevers. The importance of these nerves is not well understood; it is certain, however, that their action is too feeble to antagonize the retarding influence of the pneumogastrics, for, during maximum stimulation of the "accelerators," the thereby quickened heart is at once slowed down by even the mildest stimulation of the pneumogastrics.

To recapitulate: *The heart beats as a result of impulses arising in its own substance. The action of the pneumogastrics is always inhibitory. The "accelerator nerves" increase*

rate at the expense of force, and retard the circulation instead of assisting it. In vivisections, after the natural pulsations have ceased, the exposed heart may be made to beat again and again by applying the electrodes directly to the heart muscle; but this effect can not be obtained by the stimulation of any nerve remote from the heart. It is evident from these facts that, to stimulate the heart with electricity, we must apply the current directly to the heart itself; application of one or both poles in the neck, whether it affects the pneumogastric or the "accelerators," must produce an effect the reverse of stimulation. Unfortunately, the relations of the heart and the chest wall are so varying and uncertain that we can not hope to reach the heart efficiently with a current from electrodes applied to the præcordial space. A mild current, under these circumstances, would probably have no effect, while a strong one, reaching the heart after being widely diffused, would be as likely to excite the inhibitory apparatus and stop the heart as to get to the motor centres and stimulate it.

The question, *Can electricity be so applied clinically as to stimulate the heart?* must, therefore, be answered in the negative. The two following cases further illustrate the subject:

CASE I., described in the "Phila. Med. Times" for June 4, 1881, is that of a patient who suddenly developed cardiac failure during etherization, probably from organic disease. To quote the words of the report: "The faradaic battery was brought to the bedside, but, as the respiration was continuing comparatively unaffected, it was only applied for a short time, with one pole to the neck and the other in the præcordial region." The case terminated fatally.

In this instance respiration was not "particularly affected," and electricity seems to have been used entirely with the idea that, with one pole on the neck and the other in the præcordial region, it would stimulate the failing heart. As the poles in this position would lie over the pneumogastric nerve, it is evident that any effect upon the heart must have been the reverse of what was desired. The use of the bat-

tery as described may readily have caused the death of this patient by still further depressing the already feeble heart, and, even looking at it in the most favorable light, could certainly have done nothing to prevent the fatal termination of the case.

CASE II. is one of poisoning with hydrocyanic acid from eating bitter almonds, and is reported in the "British Medical Journal" for July 2, 1881. The patient was brought to Charing Cross Hospital in a collapsed condition, his apex-beat feeble, and his radial pulse almost imperceptible. Inhalations of ammonia were administered, and, quoting literally, "the current from twenty-five cells of a galvanic battery was applied for ten minutes—one pole over the apex of the heart and the other on the neck, over the course of the pneumogastric nerve."

These are the words of the history; and the treatment was repeated several times, the patient finally recovering. It is stated by the physician who reported the case that the favorable termination was due, in his opinion, directly to the employment of the electricity. Now, it is a fact that the current from twenty-five cells of a good battery, applied to the pneumogastrics, will kill instantly the largest dogs, stopping the heart in diastole. A current from five or six cells, applied in the neck over the pneumogastrics, will produce faintness in the average patient and diminish the pulse-rate by ten or fifteen beats. There is every reason to believe that few patients could receive the current from twenty-five cells of a good battery, applied in the manner described, without great danger of instant death from cardiac paralysis. It is evident from these facts that, judging from a rational standpoint, the treatment of this case of hydrocyanic-acid poisoning was improper and calculated to do harm; and the thought naturally occurs, How could the patient recover under the circumstances? This may be accounted for in two ways: 1. The battery may have been out of order, and the current very much weaker than we would suppose, judging from the number of cells mentioned. This explanation seems plausible when we reflect how rare it is, especially in hospitals, to find a galvanic battery in

what would be termed good working order. 2. In hydrocyanic-acid poisoning the pneumogastric nerves are paralyzed somewhat as they are after large doses of belladonna. After large doses of belladonna, the pneumogastrics entirely lose their irritability, and the strongest electric currents may be applied to them without having the least effect upon the action of the heart. In the case described, three hours passed after the bitter almonds had been eaten before the electricity was applied. It is probable that the pneumogastrics by that time were so far under the benumbing influence of the poison that they were not much affected by a current which, under more normal conditions, would have been enough to stop the heart. These facts, of course, are not alluded to in the report, the intention of which is to convey the author's opinion that the failing and inefficient heart may be successfully stimulated by galvanization of the pneumogastric. Both cases, Nos. I and II, are discussed in this paper in order to further emphasize the fact that the effect upon the heart of galvanizing or faradizing the pneumogastric is the reverse of stimulating, and is attended, in the case of strong currents, with great danger to life.

In a case where the failure of the circulation seems to be due mainly to the *rapidity* of the heart's action, it is possible that faradization of the pneumogastric may be of use by slowing the heart and tending to restore its normal rhythm. Digitalis does this; but digitalis at the same time stimulates the cardiac muscle, which the electricity would not do. It would be a dangerous thing to expose the heart to the depressing influence of the pneumogastric at a time when the circulation was already failing, and the theoretical benefit to be obtained from a temporary slowing of the heart would scarcely seem to justify so precarious a measure.

When we come to discuss the action of electricity as a *respiratory* stimulant we must admit at the outset that stimulation of the phrenic nerves causes contraction of the diaphragm. The phrenic nerves are very near the surface, and can be reached easily and with certainty by applying

the current just above the inner end of the clavicle. Even after death a current applied in this way will cause inspiratory acts again and again, until the nerves lose their irritability from commencing decomposition. It is perfectly rational, therefore, to look upon electrization of the phrenic nerves as a means by which the failing respiration may be stimulated. With this end in view, electricity may be applied in two ways: 1. A mild current may be applied *continuously*, with the idea merely of making the inspiratory acts deeper and more efficient, without particularly affecting their rhythm. 2. A current may be applied of sufficient strength to at once cause a deep inspiration, and the application be *repeated at intervals of three or four seconds.* There is abundant evidence that good results have been obtained by these methods, especially the first; these good results have been, for the most part, described in reports of cases of opium poisoning. On both physiological and clinical grounds, therefore, *if we consider stimulation of the phrenic nerves as a measure by itself*, we must accept it as a proper and logical treatment in respiratory failure. But we can scarcely consider electric stimulation of the phrenic nerves by itself, therapeutically, for the reason that the phrenic and pneumogastric lie so near one another in the neck, equally superficial and not more than half an inch apart, that it is impossible to apply electricity to one of them without simultaneously affecting the other. We can not apply electricity to the phrenic, to stimulate the contractions of the diaphragm, without at the same time applying it to the pneumogastric, whose function it is to retard and even stop the heart. *The identical measure, therefore, by which we aim to assist respiration may, simultaneously and without warning, be the means of stopping the circulation.* This consideration becomes even more significant when we reflect what mild currents of electricity are sufficient to excite the inhibitory influence of the pneumogastric upon the heart. The author had occasion, almost daily for months, to apply electricity to the pneumogastric in two cases of exophthalmic goître. In these cases the usual pulse-rate was 120 a

minute, but it at once fell to 100 or 90 when a very mild current from four to six cells of a galvanic battery was applied over one pneumogastric in the neck. If the current was increased beyond this limit, the action of the heart became hesitating, and the patients became faint and dizzy. The current which produced these unpleasant sensations was still far short of that which would be able to excite muscular contractions; if applied over the phrenics, it might have strengthened the respiratory process, perhaps, but it was certainly not strong enough to excite an inspiratory act. The author knows of a case of opium poisoning in which a strong faradaic current, which was being applied at intervals to different parts of the surface, merely to rouse the patient, was suddenly applied over the phrenic in the neck. The current reached the pneumogastric, and, as it was strong enough to stop the heart, instant death was the result.

In face of these facts, the following conclusions seem justified: 1. Electric stimulation of the phrenic nerves should never be undertaken without the reflection that the current will at the same time reach the pneumogastrics. 2. Only mild currents should be applied, their effect upon the heart's action being carefully watched. 3. Especially should be avoided the sudden or careless application to the neck of a current sufficiently strong to produce pain or muscular contractions in other parts of the body. These conclusions having been stated, it will be a further object of this paper to inquire if there be not some varieties of poisoning in which the danger of cardiac depression from stimulation of the pneumogastric is so great as to contraindicate any attempt to apply electricity to the phrenic. Different poisons affect the heart and the pneumogastrics very differently, materially altering their relations with each other. Take for an instance digitalis, which stimulates *both* the heart and the pneumogastrics, thereby slowing the beat even while increasing its force; take, then, belladonna, which stimulates the heart and yet paralyzes the pneumogastrics, giving us, like digitalis, increase in force, but with a more rapid beat from diminished pneumogastric restraint.

Contrast with these the inhalation of chloroform, which, being brought in the blood immediately from the lungs to a contact with the lining membrane of the heart, exerts a direct paralyzing influence upon that organ while the pneumogastrics are still unaffected and present their normal irritability to any stimulus. Here we have, with digitalis, both heart and pneumogastrics stimulated; with belladonna, heart stimulated and pneumogastrics paralyzed; with chloroform, heart paralyzed, pneumogastrics normal. We know that the heart, by its inherent impulse to beat again, resists the tendency of the pneumogastrics to keep it in diastole, and we see in health a balance of power kept up between these two opposing forces. We know that in health a moderate current applied to the pneumogastric will slow the heart, and even cause it to pause in diastole, without doing harm. But let us imagine a condition like sudden heart failure from chloroform, where the heart is depressed while the pneumogastric is still active. The balance of power is now disturbed, for the pneumogastric is in a condition to conduct inhibitory stimuli as usual, while the enfeebled heart has not its usual strength with which to resist them. At such a moment, might not the heart be instantly stopped and paralyzed by a degree of pneumogastric stimulation which, under ordinary conditions, would only slow the heart by a few beats per minute?

It may not be inappropriate, at this point, to relate the circumstances under which the author's attention was first called to this subject. He had prescribed for a patient who was suffering from neuralgia; the mixture was to contain ℞ Tr. aconiti rad. (U. S.), ♏xl; syr. aurant. cort., ʒ iij; aq., q. s. ad. ℥ ij. M. Sig.: One teaspoonful dose, and repeat once at the end of an hour. The druggist by mistake left out the water and sent to the patient simply ♏xl of tr. aconiti rad. in ʒ iij of syrup. After the second dose had been taken, representing in all over ♏ xx of aconite, the patient developed symptoms of poisoning. The surface was cold and clammy, and the extremities benumbed; the respiration was shallow and uncertain, and the pulse scarcely

perceptible. The author at once administered large quantities of brandy, and called in Professor A. A. Smith to assist him. In view of the respiratory failure, Professor Smith proposed faradization of the phrenic nerves. This the author objected to, knowing that a current so applied would necessarily affect the pneumogastrics as well as the phrenics, and fearing that even a slight depressing influence might stop a heart which was already acting so feebly. The patient fortunately recovered; but the case induced the author to study the subject more carefully, and finally to undertake a series of experiments on dogs poisoned with aconite, chloroform, ether, and opium, in order to ascertain whether, under these not uncommon conditions, the danger of cardiac paralysis from stimulation of the pneumogastric would be much increased or not. The mode of experiment was as follows:

First Step.—A strong, healthy dog was etherized, and a Marey's cardiometer connected with the left carotid artery. This can be done without shedding twenty drops of blood, and the same incision exposes the pneumogastrics.

Second Step.—A faradaic battery was connected with both pneumogastrics by wire-hook electrodes, and adjusted so as to give a current just strong enough to slow the heart's action perceptibly, without otherwise disturbing it. The electrodes were then removed from the pneumogastrics and kept ready to be reapplied later in the experiment.

Third Step.—The drug to be experimented upon was administered, and the cardiometer watched for evidences of cardiac failure.

Fourth Step.—As soon as the cardiometer gave evidence that the heart was becoming weak, the faradaic current was passed to the pneumogastrics in the same strength which had, in step No. 2, been found to merely slow the heart. The cardiometer was then watched to measure the effect upon the heart. This plan of experiment seems calculated to show quite accurately whether the poisoned heart is liable to be paralyzed by a degree of stimulation of the pneumogastric which the healthy heart was perfectly well able to

stand before the poison was given. The experiments, in detail, were as follows:

Experiment No. 1 *with Aconite.*—Dog etherized. Cardiometer connected. Battery adjusted to a strength which merely slowed the heart. One drachm of tincture of aconite was then poured down the dog's throat. After eight minutes, heart acting feebly and intermittingly. One minute later, applied battery to pneumogastrics. Expected to see the heart stop entirely, or at least show signs of great depression. Was surprised to see no effect produced upon the heart by stimulating the pneumogastrics. Increased the strength of the current until the full force of the battery was reached, but still with no effect upon the heart. This proved that the pneumogastrics were paralyzed by the aconite, and could no longer be excited to exert any inhibitory influence upon the heart.

Experiment No. 2 *with Aconite.*—This was a repetition of No. 1, with the same result. As soon as the heart showed evident signs of weakness from the aconite, the pneumogastrics were found to be so paralyzed that no current applied to them, however strong, had any effect upon the heart.

Experiment No. 3 *with Aconite* was a repetition of Nos. 1 and 2, with the same result.

Deductions.—Experiments go to show that the tendency to cardiac paralysis from stimulation of the pneumogastrics is *not* increased in aconite poisoning. Indeed, in the later stages of poisoning there is *no* danger in stimulating the pneumogastrics, for they are so paralyzed that no current applied to them has any effect upon the heart. In the treatment of aconite poisoning, therefore, the application of electricity, with proper care, to the phrenic nerve, is perfectly safe.

N. B.—This result shows that the treatment advised by Professor A. A. Smith, in the author's case of aconite poisoning, would have turned out all right, in spite of the objection which the author then made to it.

Experiment No. 1 *with Chloroform.*—Dog etherized. Cardiometer connected. Battery adjusted to a strength which

merely slowed the heart. A sponge with chloroform on it was now substituted for the one with which ether was being administered. Chloroform was administered rapidly and in such quantity that poisoning ensued at once, the blood-pressure falling after a few seconds, and the heart-beat becoming feeble and irregular. The chloroform was now taken away and the faradaic current was applied to the pneumogastrics. The effect was instantaneous—the heart stopped in diastole and did not beat again.

Experiment No. 2 with Chloroform.—Performed in the same way as No. 1. When the current was applied to the pneumogastrics, the heart did not stop at once. It paused in diastole for a few seconds and then commenced to beat again, but very feebly. The blood-pressure did not again rise to more than half the normal, and the heart stopped finally after six minutes.

Experiment No. 3 with Chloroform.—Same mode of experiment. The heart stopped instantly when the current was applied to the pneumogastrics, exactly as it did in Experiment No 1.

Deductions.—When heart failure occurs early in chloroform administration, the pneumogastrics are still normally excitable. At such a moment, even a very mild electric current applied to the pneumogastrics will instantly paralyze or fatally depress the heart. It is therefore eminently dangerous to apply electricity to the neck of a patient with heart failure from chloroform. The application over the phrenic of a current strong enough to cause contraction of the diaphragm would be almost certain to cause fatal cardiac depression.

Experiment No. 1 with Ether.—Dog etherized. Cardiometer connected. Battery adjusted to a strength which merely slowed the heart. The ether was then crowded until respiration was paralyzed and asphyxia ensued. The faradaic current was then applied to the pneumogastrics, but produced no more effect upon the heart than it did in the earlier stage of etherization, before the ether had been pushed to the extent of inducing asphyxia.

Experiment No. 2 with Ether.—This was the same as Experiment No. 1, and gave the same result.

Deductions.—That in asphyxia from etherization the heart can stand stimulation of the pneumogastrics as well as it can in health. Therefore it is safe to stimulate the phrenic nerve in ether poisoning with a current as strong as the patient could bear under normal conditions.

N. B.—The difference between the results obtained in the chloroform poisoning and those obtained in ether poisoning is due to the fact that chloroform is a direct cardiac depressant, while ether does not depress the heart. If a dog is etherized, the trachea opened, and a bellows inserted so that respiration can be carried on artificially by the experimenter, then ether can be administered by means of a sponge fitted over the supply-opening of the bellows. In this way respiratory paralysis is rendered impossible, and the effect upon the heart alone can be studied. Under these circumstances ether may be administered for hour after hour, and in almost any quantity, without depressing the heart; if, however, a sponge with chloroform on it is substituted for the ether, the heart soon becomes weak and the blood-pressure falls rapidly. Changing back to ether stimulates the heart again to its original force, and changing still again to chloroform will again depress it. This proof that chloroform is essentially a cardiac depressant, and that ether is not, is as satisfactory as experimental proof could be.

Experiment No. 1 with Morphine.—Dog etherized. Cardiometer connected. Battery adjusted to a current which merely slowed the heart. One grain of morphine injected hypodermically and ether stopped. As soon as the heart became rapid and feeble and the breathing very slow, the faradaic current was applied to the pneumogastrics. No effect upon the heart. This proved that in opium poisoning, when the symptoms of poisoning are well marked and the pulse rapid and feeble, the pneumogastrics are paralyzed, and stimulation of them will not slow or depress the heart.

Experiments Nos. 2 and 3 with Morphine gave the same results as No. 1.

Deductions.—That in opium poisoning, when the heart is rapid and feeble, there is even less danger than in health of cardiac paralysis from stimulation of the pneumogastrics. It is, therefore, safe to carefully apply electricity to the phrenic nerve in opium poisoning.

When morphine, ejected hypodermically, accidentally gets into a vein, sudden and alarming collapse is apt to follow. Under these circumstances, the morphine, thrown directly into the circulation, reaches the heart all at once and without much dilution in the blood. It must, therefore, exert a benumbing effect upon the heart itself for some time before it has reached the pneumogastrics in sufficient quantity to paralyze them. As this association of feeble heart with pneumogastrics still normal resembles the condition encountered in sudden heart failure from chloroform, the author undertook the following experiment:

Experiment with Morphine injected into a Vein.—Dog etherized. Cardiometer connected. Battery adjusted to a current which merely slowed the heart. Then half a drachm of Magendie's solution of morphine was injected into a small vein in the neck. The blood-pressure at once fell one half, and the respiration almost ceased. The faradaic current was now applied to the pneumogastrics. The heart stopped almost as suddenly as in the case of chloroform poisoning, but not so completely. It still continued to beat feebly for a minute or more, but then stopped.

Experiments Nos. 2 and 3 with Morphine injected into a Vein gave substantially the same results as Experiment No. 1. In neither case was the heart stopped by the application of electricity to the pneumogastrics, but in both instances it received a shock from which it did not rally, and beneath which it finally sank at the end of a minute or two.

Deductions.—When morphine is injected into a vein, the heart is easily depressed by electricity applied to the pneumogastrics. It would *not*, therefore, be safe to faradize or galvanize the phrenic in this condition.

In conclusion, the views expressed in this paper may be summarized as follows:

I. Electricity *can not* be applied clinically in such a way as to stimulate the heart, literally speaking. In cases, however, where the heart is rapid, without much impairment in force, a mild current might be carefully applied over the pneumogastric in such a way as to restore the normal rhythm, and so increase the general efficiency of the heart's action. Cases are rare, however, where this would be indicated, rapidity and irregularity of the heart's action being generally associated with such feebleness as would contra-indicate any stimulation of the pneumogastric.

2. The application of one pole in the neck and the other over the præcordial space directs the current to the pneumogastric nerve, and retards the heart instead of stimulating it. A strong current applied in this way may stop the heart and kill the patient instantly.

3. An electric current applied over the phrenic nerve necessarily stimulates the pheumogastric at the same time. This measure, therefore, always threatens as much in the way of cardiac depression as it promises in the way of respiratory stimulation.

4. Liability of the heart to be stopped by pneumogastric stimulation is not increased in aconite, ether, or opium poisoning. It is, therefore, permissible to cautiously apply electricity over the phrenic nerve in these conditions.

5. In heart failure from chloroform, and when morphine has been injected into a vein, the heart may be stopped by even a slight current applied to the pneumogastrics. The application of electricity over the phrenic is, therefore, strongly contra-indicated under those conditions.

6. And, finally, it is emphasized that under no circumstances should a current strong enough to contract muscles elsewhere in the body be suddenly or incautiously applied over the phrenic or pneumogastric, or anywhere in the neck.

ÆSCULAPIA AS REVEALED BY INSCRIPTIONS.*

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THE literature that has descended to us in the Greek tongue is indeed voluminous, but there are many chapters of Hellenic life which are totally lacking in these sources, or are touched upon only in passing allusions, which pique rather than satisfy our desire for a better knowledge. Among these must be placed the temples of Æsculapius, their priestly polity, priestly practices, and the treatment of patients within their precincts. Much has been written in modern days, in histories of medicine and similar treatises, upon this subject, and, as usual where the facts are few, imagination and inference have been largely drawn upon with varying results, in attempting to weave a connected whole out of the scattered notices. It is one of the glories of the ancient Greeks that they were able to live a life so fruitful that every memorial of it, however meagre, proves of intense interest to us at a distance of twenty centuries. The fascination which gathers about the beginning of things rests like a brilliant aureole upon their land, and continually incites generation after generation of scholars to inquire and gather, and never rest while a grain is still to be gleaned. One mine of information which lay almost neglected a cen-

* Recast from a paper read before the New York Academy of Medicine, March 19, 1885.

tury, nay even fifty years ago, is now yielding rich results. The spade is returning to the light of day countless treasures which mother earth has been gently clasping within her bosom through all the centuries, and keeping for those who will. Fortunately for us, the day of the fragile newspaper is recent. Greece inscribed her records on stone or metal, and though these descend to us far too often in a sadly mutilated form, they still offer materials richly varied, and priceless in their capacity to supplement our literary sources, and especially to open vistas into the very hearts of the people, disclosing the hopes and fears, the faith, the practices and habits of the times. The zeal with which excavations have been pursued within the past decade has been productive of corresponding acquisitions in numberless subjects, and medicine in its historic aspect has not lacked her share. In Greece the greater part of the excavations are conducted by the Archæological Society of Athens, and it is to their labors that we owe the results which will be embodied below, and which have accrued from laying bare the sites of the temple of Æsculapius at Athens, and the still more famous one at Epidaurus.

Of the temple at Athens, we have mention in the Plutus of Aristophanes * where the cure of the blind god of wealth is described; in the Memorabilia † where Xenophon speaks of its warm spring, and by Theophrastus,‡ in his Characters, while portraying the zeal of a man who had dedicated a bronze ring in the temple and went every day to keep it bright with garlands and to anoint it. Æschines,§ in his speech against Ctesiphon, charges Demosthenes with summoning an assembly of the people on the sacred day, in the spring month, when the sacrifice and religious ceremonies were to be performed in honor of Æsculapius, a proceeding, he says, on the part of his opponent, which no one remembers ever to have had a precedent. Pausanias ‖ enumerates the temple among the most famous scions of Epidaurus,

* Aristoph. Plut., 620–747.
† Xen. Mem., iii., 13, 3.
‡ Theophrast. Char., xxi., (5.)
§ Æschin. Ctes., 67.
‖ Paus., ii., 26. 8, i., 21, 4.

and declares that it is worth seeing for the statues of the god and his children, and for its paintings. Both Plutarch* and Ælian † relate the story of the thief who succeeded in entering the temple during the night and carrying off a number of the gold and silver offerings, without detection by the temple servitors, who were less watchful than a dog that followed the thief persistently, barking and attracting the attention of the passers, till the objects were missed, and the thief was arrested with the dog still at his heels.

Finally, in his life of Proclus, the philosopher of the 5th century, A. D., Marinus ‡ relates that this commentator of Plato was a frequenter of the temple, and on one occasion, when a friend had a daughter so ill that the physicians had given her up, her father went to Proclus and begged him to go to the temple and intercede with the god for the daughter's recovery. His prayers were so efficacious that the maiden began to mend at once, and recovered. It is supposed § that soon after this, about 500 A. D., the temple was destroyed by the Christians, and they built a church amid its ruins.

The sanctuary was ensconced close beneath the Acropolis, on the south side, between the great theatre on the east, and other structures on the west. Here, sheltered from the north winds, which are very severe in winter, and lying under the sun all day, it was happily situated, with a magnificent panorama in the distance towards the Peloponnesus south. Excavations were begun on this site in 1876, and continued more than a year, laying bare the substructions of two temples, and the adjacent buildings for the priests and suppliants. The western temple was the older,‖ to judge from the foundation walls, which were of Piraean stone, attesting a good epoch of Greek work; and was also the smaller, 16x13 feet. The eastern temple was 30x14

* Plut. de Solert. An., 13. † Æl. Hist. Nat., vii., 13.

‡ Marin. Vit. Procl. xxix.

§ Koehler, Mittheil. des deutsch. Archæolog. Instit. Athen. ii., p. 259.

‖ L' Asclèpieion d' Athènes d' après de récentes découvertes, P. Girard, Thorin, 1881, a work from which considerable assistance has been derived.

feet. Adjacent to it was a portico nearly 100 feet long, the dormitory for the patients, and its remains bear witness to its erection in the 4th century B. C. Another, 90x41 feet, near the older temple, must have been built nearly two centuries later. Many inscriptions were discovered upon the site, and they give us the most complete knowledge of the priestly polity and the position of the cult in the religion of the state, to be obtained from any source, as well as many particulars in relation to the buildings, their contents and practices. One of these* informs us that the priest, who had just been elected for the coming year, appeared before the Senate, and reported that the ancient temple and some of the other structures needed repairing, and he offered to do it at his own expense. His request was granted, and he was allowed to record the fact with his own name on the parts reconstructed. This inscription belongs to the latter part of the last century before our era. Soon after,† B. C. 5, another priest is less liberal. His building is paid for "out of the revenues of the god." The precinct was of considerable size, enclosed by a wall, and was adorned not only with temples and porticos, but other buildings, with statues, and offerings of every kind. In the temple proper would be kept the offerings in precious metals, on tables, shelves, the walls, and even suspended from the ceiling.‡ The marbles with inscriptions, bas-reliefs, etc., were disposed mainly in the other buildings, on exterior walls and about the precinct. Twice mentioned within the sanctuary is a statue of Polycritus,§ who has been reasonably supposed to be the celebrated physician of Mende in the time of Conon. Besides the pictures alluded to by Pausanias, the temple contained the statue of the god, with a bed near by, on which the statue was laid during festal occasions, a table for the repast of the god, and an altar. We have several fragmentary inventories of the other objects, one ‖ that extends

* Kumanudes, Athenaion, v., p. 104; Corpus Inscriptionum Atticarum, ii., 489 b; Dittenberger, Sylloge Inscrip. Graec., 356.

† Athenaion, v., p. 419.

‡ C. I. A., ii., 766, 835, 836.

§ C. I. A., ii., 766.

‖ C. I. A., ii., 836; cf., 405 b.

to considerable length and is fairly complete as far as it goes. It is probable that this was not a complete inventory of all the objects, such as has been found in Delos, of the Apollonian temple there; * it belongs rather to another class, of which we have examples from the sanctuary of the "Hero Physician," † another healing deity at Athens, and from the temple of Amphiaraus at Oropus,‡ where numerous cures were believed to be effected. The occasion for such records was this. At times the temples would become embarrassed by the number of offerings in precious metals, and it would be convenient to melt them down and manufacture something to be of use in the service of the god. As the preamble of our inscription is so mutilated that only an occasional word can be recovered, the mode of procedure is learned in the main from that of the "Hero Physician." The priest appeared before the Senate, reported the necessity and recommended the appointment of a commission, in our case of ten, five Areopagites and five from the citizens, who in conjunction with the strategos and priest, were to discharge the duty. These were appointed, and proceeded to select the objects to be used, and three pieces of furniture were manufactured—a table, a censer and a sacrificial plate or basket. The articles employed were extremely numerous, and consisted mainly of representations of parts of the body in which the ailment was centred; as the face, eyes, mouth, nose, teeth, ears, neck, breasts, hands, fingers, knees, privates both male and female, hips, breast, heart, and even the whole body. Pieces of money are also common, cups of all kinds, and a number of large vessels which had been manufactured under similar circumstances during the office of earlier priests. All of these objects, except the few that were uninscribed, were entered upon the list with the name of the donor, its description, weight, or value, and sometimes the priest under whom it was consecrated; and this list was inscribed on one tablet set up in the temple itself

* Bulletin de Corr. Hellén., vi., 1882, p. 29; Ditt. S. I. G., 367.

† C. I. A., ii., 403.

‡ Anc. Gr. Inscr., Brit. Mus., ii., 160.

and another in the Metroum in another part of the city. Hence these tablets contained a full record of each piece broken up, and an account of its disposition, that it might never perish wholly from sight, but the guerison of the god be ever remembered and carefully treasured. At the conclusion of its labors the commission was discharged with the thanks of the Senate. This inscription falls about 270 B. C. A second * of nearly of the same length is a proper inventory of the temple belongings, and describes the objects by their position on the right or left, behind the door, "to the right of the god," etc. This belongs somewhere within the years 320–317 B. C. A shorter one † arranges the offerings according to years, covering 340–39–38 B. C., with from twenty to thirty consecrations, each year. These numbers must have varied greatly, however, from various causes, especially the prevalence of local maladies, among which the most frequent was a trouble with the eyes, that is still very common in the Greek world.

From modest beginnings of a single small temple, but with a dormitory attached as early as Aristophanes, a gradual growth went on, as may be seen from the earliest inscriptions in the 4th century B. C. up to the latest in the 3d A. D., and instead of there having existed a profound repugnance to it, as some have imagined, the cult became one of the most popular in Greece and maintained its ground among the latest. Three hundred and twenty Æsculapia at least are known to have existed in antiquity, so that every town of importance must have had its sanctuary. The buildings increase in size, number, and splendor, keeping pace with the exaltation of the fame of the sanctuary and its importance in the religious observances of the state. Commensurate with this was the augmentation in the dignity of the priest and servitors of the temple. Aristophanes describes the priest as eager to gather all the cakes and figs left about the tables and altars, for his own use; and the single servitor mentioned is engaged in extinguishing the

* C. I. A., ii., 835. † C. I. A., 766.

lights, though there might have been others. In the inscriptions the priest appears as an important personage in the state.* He has to see to it that the proper sacrifices for the safety and health of the Senate and Demos, their wives and children, be performed according to the laws and decrees, that the temple be richly decorated at festivals, that the bed for the statues of Æsculapius and Hygieia be munificently furnished, that the table for the sacred repast be handsomely garnished, and that the sacred vigil, or service lasting the night through, be conducted with all pomp and circumstance, and especially the festival which was connected with the Eleusinian Mysteries, in which a grand procession was conducted to the temple and service performed by the people in a body. The manner in which these duties were discharged was reported to the Senate and the people, and the priest was publicly thanked, a crown decreed him, and the inscribed decree erected in the sanctuary. One inscription† speaks of his offering sacrifice on behalf of the state to the god in Epidaurus, and another ‡ notes that he had charge of the allotment of jurymen to the several courts, probably in his civil capacity, as thesmothete or one of the Archons of the year, because as priest he was still a citizen. In this case he is not only thanked by the Senate and people, but a special decree in his praise is passed by his tribe and erected in the Æsculapium and in the Heroum of the tribe. Except in the case of a near relative of the orator Demosthenes, who was appointed priest by an oracle from Delphi,§ all priests during the 4th, 3d, 2d, and 1st centuries B. C. were selected by lot annually.‖ But about the beginnning of our era, the worship of the emperor Augustus, here¶ as at Cos,** and probably at Epidaurus,†† was united with that of Æsculapius and Hygieia in the

* C. I. A., ii., 373 b, 453 b, 453 c, 477 b, 477 c.
† Athenaion, vi., p. 137.
‡ C. I. A., ii., 567 b.
§ Ditt. S. I. G., 368, C. I. G., 459.
‖ C. I. A., ii., 489 b, Ditt. S. I. G., 356.
¶ Athenaion, vi., p. 146, C. I. A., iii., 68a.
** Bullet. Corr. Hellén., 1881, p. 468.
†† Athenaion, x., p. 528.

same temple, and it is probable that then the tenure of the priesthood was changed; at all events, about forty years later we find mention of a priest for life,* as also in the 2d and perhaps 3d century A. D. The valuables of the temple, whether offerings or otherwise, were under his charge, and he was held responsible to the state for their safe-keeping, as shown by the inventories, and the care with which each object was described, and the occasional notices of the fact that one has been injured or some portion been lost. In this, as in many other particulars, the Æsculapium stood on the same footing as the other temples. Like the other priests, he had a conspicuous seat appropriated for his use in the great theatre, and his title has been found inscribed upon it.†

The other officers of the sanctuary were the Zacoros, the Cleiduchos and the Pyrphoros. Of these, the first became a veritable functionary in Roman times, nearly equal in dignity to the priest, and his name served to date the offerings.‡ He consecrated ex votos to the god, composed hymns in his honor, and repaired the temple at his own expense.§ The Areopagus and Senate, in two instances at least, erect statues in his honor in the sanctuary. His tenure of office in one inscription is for a year. Of his specific duties at Athens we obtain no information, but elsewhere he is known to have special charge of invalids, to give them advice in the interpretation of their dreams, perform operations, and administer remedies prescribed by the god. Twice at Athens he is said to be a physician, as the priest is denominated at least once. It is improbable that the latter was always a physician. While he was elected by lot annually the chances would be widely against it, and as the names we have do not appear to recur by a second choice, while in one case the priest is archon the same year, we may be said to reach nearly a certainty. In fact, it must be remembered that the Æsculapia were not hospitals proper, where the invalid came to put himself under the care of skilful physicians,

* C. I. A., iii., 132.
† C. I. A., iii., 287.
‡ C. I. A., iii., 181 c.
§ C. I. A., iii., 68 e.

but temples, in which human skill was regarded as unavailing, and the suppliant appealed in good faith to the divinity whom he believed to have the power and will to work a miracle in his behalf, in case he could win the god's favor. This belief was firmly rooted in the hearts of the Greek race, as a whole, and was fondly cherished by a large majority from the days of Homer to the downfall of the pagan faith. It was the foundation of their religious observances, the occasion of their pomps and festivals. Public hospitals there were at Athens, with their physicians supported by the state, to which the poor could resort at any time for human aid without cost. Other physicians there were without stint in private practice for those who could pay the fee. But when, like Æschines, the great opponent of Demosthenes, as he tells us of himself in a stanza that has descended to us,* they despaired of human aid, then they turned to the more powerful physician, the patrial divinity of physicians themselves, Æsculapius, to whom the practitioners attributed the foundation of their art, and to whom they themselves sacrificed for help and guidance. An inscription relates that, "It is a patrial custom for all state physicians to sacrifice twice every year in the Æsculapium to Æsculapius and Hygieia, in behalf of themselves and the persons they have cured."†

With such beliefs the suppliant must approach the deity with pure hands and pure heart, with ablution, sacrifice, prayer, incense and song. All may not hope to find the god propitious. He is expected either to appear to them in a dream and heal them outright, or to indicate by dreams the remedies adapted to their cure.‡ To the wicked he will not appear at all, or if he does, he is likely to punish, not to heal, as will be seen below, and in the case of Neoclides in the Plutus of Aristophanes. During the day, preparation is made for the night's sleep, and the hoped for

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* Brunck, Analec., i., p. 176. † C. I. A., ii., 352 b.

‡ Even Galen acknowledges that minutely detailed courses of treatment have thus been prescribed by Æsculapius (de San. Tuend. I, Kühn, vi. p. 41), and patients have been cured by him (Kühn, vi., p. 869).

epiphany or dream. In the Plutus the blind suppliant is first bathed in the sea, as the most efficacious means of purification. Then he is led to the temple, where they offer a sacrifice of cakes burned on the altar, together with incense, no doubt with prayers and other offerings. Elsewhere we hear of fastings enjoined. Among the objects discovered in the excavations on the site at Athens was a number of ex votos depicting in bas-relief the scenes of suppliance and adoration. In the most of them * the god appears seated on a throne with Hygieia standing beside him in various attitudes, sometimes with her hands held out in benediction over the suppliant. In one, an altar stands before them, upon which are cakes, figs and other objects, with a flame rising from the centre. Beside it stands a youth holding a ram for sacrifice, and behind him appears a number of suppliants with right hand raised in adoration. The sculpture belongs to the 4th century B. C., and is an excellent specimen of mediocre art, with great truth to nature. We seem to see the very scene before us. By all these ceremonies, by the incense, by the lights, by the hymns, the imagination of the invalid is powerfully excited as evening draws on, and when the word is given they all lie down to rest in hope and fear. Each comes provided with his mattress or blanket for the night, and attendants sleep beside the patient, for the dream may come to them, as well as to the patient himself. Indeed, if the patient was too ill to come in person, some relative or representative might present himself in his stead, as Proclus for the sick girl mentioned above. Several of the inscriptions † at Athens note that the offering is made in behalf of children by parents, or other relations; and one at Rome‡ is presented by a physician, for his patient. One of the bas-reliefs seems to exhibit a scene in a sick-room, with the patient on his bed, attended by his physician, while the god stretches out his hand in benediction and promise above him, perhaps to

* Bullet. Corr. Hellén., 1878, 1881. Mittheilungen deutsch. Inst., II., Girard, L'Asclépieion.

† Athenaion, vi., p. 279 seq.

‡ C. I. G., 5983.

portray some dream on the sick-bed, like that of the Cypriote friend of Aristotle mentioned by Cicero.* Aristides, the famous orator of the 2d century of our era, who for 13 years of illness was guided, as he says in his six orations on the subject,† almost continuously by the god, was visited by his dreams at home as well as in the temples at Smyrna and Pergamus, and at times they came to his attendants or physicians, the zacori of the temple, or even strangers. The unexampled attention paid to dreams in antiquity is well known, and is fitly illustrated by the Hippocratic treatise on Dreams,‡ in which a series of rules is laid down by which the physician is to be guided in prognosticating maladies foreboded by dreams, and the proper remedies are prescribed. It appears from Aristides that these or similar rules were occasionally employed in the interpretation of the temple visions. Many inscriptions§ declare that they were offered in obedience to a dream, or as bidden by the god, both at Athens and Epidaurus. One ‖ at Athens reads, "The Senate, at the command of the god, erect a bust of Sosicles who was cured by Æsculapius and Hygieia." If the vision did not come at once, or if the remedies prescribed by it did not prove efficacious, the patient remained, according to the extent of his faith or the benefit accruing. Æschines relates ¶ that he was three months in attendance at some Æsculapium before he was cured of an ulcer. One point that recommends the temple of Æsculapius strongly to the impecunious Chremylus in the Plutus, is the fact that it will cost him nothing to take his patient there, except what is necessary for the sacrifice. This seems to have been pretty generally the case. If the patient staid on, of course he would have to maintain himself, and pay such fees for attendance as he might anywhere.

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*Cic. de Div., i., 25, 53, quoting Aristotle.

† Aristid. Orat. Sacr. Dindorf, i., pp. 445-551.

‡ Littrè Hippocr., vi., pp. 640-663.

§ Athenaion, v., pp. 323-340, etc. Ephemeris Archaiologike, 1883, pp. 31, 147, 150, 151.

‖ Athenaion, vi. p. 371.

¶ Brunck, Analecta, i. p. 176.

But the guerdon for cure went to the god, in the shape of some offering, of greater or less value according to the means of the individual. This, as will be seen below, was expected to be paid within a year, and was usually inscribed at least with the name of the donor and the priest under whom it was consecrated. The objects were extremely varied, from costly utensils or pieces of art, to terra cotta images. At Athens among the donors' names those of women appear most frequently, and almost all are natives of Attica, as far as appears, though a few from beyond seas occur. No famous names have been discovered among the consecrations, but the offerings of the Demos are not uncommon, as also of the Senate. The physician of Mende mentioned above probably had a statue there, and also the orator Demosthenes; while the Senate honored other citizens with this distinction, especially a certain Rhodian physician named Pheidias who had bestowed his services gratis upon the people at Athens, 304 B. C.* A mutilation of the stela† deprives us of the knowledge of the object consecrated by a physician Nichomachus, but it was worth 20 drachmas. The catheter is elsewhere mentioned,‡ and a bas-relief represents a case of surgical instruments. From all this it will be seen that the asserted antagonism between physicians and the priests and temples had little if any existence, at least in Athens; on the contrary they appear here in harmony.§ In fact the picture is quite a different

* C. I. A., ii., 256 b. † C. I. A. ii. 836. ‡ C. I. A., ii., 835.

§ Daremberg has done good service in showing that the advance in medicine before Hippocrates was not altogether due to temple practice, but he errs on the other side in declaring that the Asclepiads were all laics, and had no connection with the temples as priests. It is more commonly supposed that the family of Hippocrates held the priesthood at Cos in their hands, and this on general grounds accords with what is known on the subject. Besides, in the Hippocratic letters, which, though later than Hippocrates, are early enough to embody trustworthy notices of customs, we find him engaged in celebrating the annual festival of the "assumption of the staff" with processions and shows, as belongs to all connected with the family (Littré, ix., p. 326). This would naturally refer to the festival of Æsculapius, and when the language is compared with that of an inscription at Cos (Bullet. Corr. Hellén., 1881, p. 213) the probability is greatly strengthened. But we now have positive proof of the

one, as actually shown by the monuments, from that frequently sketched by vivid imaginations starting from a standpoint twenty centuries too late. What then were the revenues of the temples and the priests? Apparently no fees from suppliants to any extent,* and certainly not the offerings, which belonged to the god, and were sacredly guarded, inventoried, and handed down from generation to generation. Like the other sanctuaries, the temples of Æsculapius undoubtedly had lands appropriated to their use, which were let out, and brought in considerable returns. When the relative of Demosthenes was made priest by the oracle, his house and garden were also consecrated to the god, and became part of the property of the temple. Bequests also might have been made, as to churches and hospitals at the present time; and no doubt the state granted lands, as in other cases which we know. Many temples were possessed of large sums of ready money, which they loaned at a round interest to cities and individuals.† Usually a definite part of every victim sacrificed went to the priest. In many places this included the hide, but at Athens the hide-money went into the state chest. At the Æsculapian festival of the year 334 B. C.‡ this amounted to 291 drachmas; in 333, to over 200; in 332, to 1,000. For the following year there are two entries, but the numbers are destroyed. At Cos a monthly sacrifice was offered by public officers of the state to Æsculapius and Hygieia, and the price of the victims was above 100 drachmas.§

An inscription, probably from Chalcedon,‖ opposite Byzantium on the Bosporus, gives an account of the sale of the priesthood, with the regulations decreed by the state, about 200 B. C. Such sales are known elsewhere in the

connection of the family of Asclepiads with the priesthood, at least in later times. A certain Xenophon, who attained the distinction of serving as chief physician to the Emperor Claudius, was an Asclepiad of Cos by lineal descent, according to Tacitus (Ann., xii., 61), and a Coan inscription denominates him at the same time priest of Æsculapius and Hygieia for life (Bull. Corr. Hellén., 1881, p. 468).

* See, however, Luc. Alex., 19.

† C. I. A., ii., 814.

‡ C. I. A., ii., 741.

§ Bullet. Corr. Hellèn., 1881, p. 221.

‖ Litt., S. I. G., 369.

case of other cults. The purchaser shall have certain privileges, some of which cannot be made out by reason of the mutilation of the stone, but he shall wear a crown at festivals, go to public banquets, and use any public ground about the sanctuary, if the city does not build upon it. He must be sound and possessed of all the members of his body, and be eligible to any of the city magistracies and other civic honors. A father may purchase for his son, but for no one else but himself. If any one institute any proceedings whatsoever to deprive the purchaser of his office, he shall be subject to a fine of a thousand drachmas to Æsculapius. The purchaser shall pay half the purchase money in January, and the rest in February. When all is paid he shall be consecrated in his office at his own expense. He shall deck the temple every day and see to it that the stoa adjacent to the Æsculapium be kept pure. His revenues shall begin with the month Machaneus. The price of the priesthood shall be 5,000 drachmas, plus the tax on the sale.

Lucian says* that it is no less an honor to Æsculapius if those who resort to him sing the paeans composed by Isodemus of Troezene and by Sophocles, in his praise, than if they should write them themselves. Of those of Isodemus we know nothing more; but the heading of that of Sophocles † has been discovered beneath the Acropolis, though only a line or two can be read. Another noted hymn was that of Ariphron of Sicyon to Hygieia, quoted by Athenæus,‡ and found inscribed at Athens in 1688, in conjunction with another to Telesphorus.§ The hymn of Ariphron was translated by Johnson in the 48th number of the Rambler. Aristides composed any number of hymns, and was greatly delighted when the divinity informed him in a dream that one of them was sung in Egypt. The only inscription at Athens around which is diffused the aroma of personal interest is the following composition. It can lay no claim to poetic excellence, but is intended by the author to be

* Encom. Demosth., 27.
† Athenaion, v., p. 340.
‡ Athen., xv., 63.
§ C. I. A., iii., 171.

couched in the form of a strophe, antistrophe, and epode. The composer is the zacoros of the temple.*

"The offering of Diophantus of Sphettus. I thy faithful servitor ask thee this, O son of Apollo: How shall I enter thy golden temple, thou blessed one, ever desired, dear heart, if my feet no longer serve me, with which I once passed within thy sanctuary—unless thou wilt kindly lead me in healed, that I may behold thee, my patron god, brighter than the earth in springtime?

"Diophantus thus prays to thee: Save me, O blessed one, O thou of mighty power, healing me of this villanous gout; by thy father, I beseech thee, to whom I loudly pray. For no one of mortals can give a surcease from such pangs. Thou, alone, divinely blessed one, hast the power: for the gods supreme bestowed in thee, all pitiful one, a rich gift upon mortals, as their deliverer from sufferings.

"Thrice happy, O Paean Asclepius, is Diophantus, cured by thy skill of a torturing, villanous malady. Never more shall I walk like a crab, nor step as on cruel thorns, but nimble and upright, yea, as thou promised."

Pausanias speaks of no tablets at Athens inscribed with any method of cure, and we are left in similar ignorance by the excavations. In the Plutus, the cure is represented as instant by divine power, and so it would seem in the case of poor, gouty Diophantus. Therapeutic means, other than such as work upon the imagination, may have been employed, but, after all the excavations there, we can only say we do not know, unless the numerous bathing-scrapers (stlengides) among the offerings be regarded as evidence.

To pass across the gulf of Ægina, from the Æsculapium of Athens to the Æsculapium of Epidaurus, is to go from the offshoot to the parent stock. And yet, although Pausanias† was convinced that Epidaurus was to be regarded as the birth-place of the god, it is more probable that the cultus was brought by Phlegyan immigrants from Tricca, in Thessaly. The sanctuary at Epidaurus was situated five miles, according to Livy,‡ from the city itself, back from the coast,

* C. I. A., iii., 171 a. † Paus., ii., 26. ‡ Livy, 45, 28.

nestled among the mountains that surrounded it on every side, and shut it in completely from the outer world. The vale itself is small, but described as one of the loveliest in Greece, plentifully watered and lush with vigorous vegetation. A thick grove spread out about the temple, and covered the sides of the neighboring mountains. The ancients remarked that the Æsculapia were usually situated in the most salubrious spots to be found, and this must have been eminently true of that at Epidaurus. To the natural advantages, add all the splendors of consummate architecture, painting, and statuary, and we may easily recognize the sentiment as typical which led the painter, Pausias, to adorn one of the buildings, the Tholos of Polycleitus, with a picture of Cupid, his bow and arrows thrown aside, bearing the lyre instead,* fierce passion yielding to the power of music and the gentler influences. Somewhat similar was the subject of the pediment of the east end of the temple, which depicted the battle of the Centaurs with the Lapiths, brute passion against law and order, as that of the west end, the defeat of the Amazons. Music, hymns to the god, poetical recitations, dramas, and various games were made much of, and well provided for. Plato † represents Socrates as holding a conversation with an Homeric rhapsode, Ion, who had just returned from a victory he had won at Epidaurus; and the name of an Athenian comic poet, otherwise unknown, appears in an inscription as victor there in imperial days.‡ The remains of a stadium are still to be seen, and the theatre is one of the most beautiful, as one of the best preserved, in Greece. Pausanias says § that Roman structures can boast greater elaboration of ornament, and Megalopolis a theatre of greater size, but, for real beauty and classic purity, who could vie with Polycleitus, its architect. That it should have been of such size as this implies, shows what must have been the crowds that flocked thither in the festival seasons. It was built upon the lower slopes of the mountain, looking out over the valley to the north, and the

* Paus., ii., 27.
† Plato, Ion, 1.
‡ Ephem. Arch., 1883, p. 27.
§ Paus., ii., 27.

heights rose so quickly above it that the seats were in shade after midday. It has been fully cleared out recently, and must be worth a visit to see. Besides these structures, Pausanias* describes in his time (second century, A. D.) the Dormitory in which the suppliants slept, awaiting the appearance of the god in dreams, a handsome fountain with ornamented roof, sanctuaries of Artemis, Aphrodite, Themis, the gods called Epidotæ, and of the Egyptian Hygieia, Æsculapius and Apollo. An ancient custom forbade any birth or death taking place within the holy ground.† If either of these events was to occur, the patient must be removed outside; and, as no building was erected there for them, the patient must give birth or die in the open air. This, however, was provided for in the time of Pausanias, by Antoninus, who erected a building for this special purpose, as well as several others, among them a bath. The remains in the valley show the bathing facilities to have been lavish.

Excavations were begun in the theatre by the Athenian Archæological Society on the 16th of March, 1881,‡ and are still progressing. After clearing out the theatre, the site of the temple was defined, and some of the other structures, as the Dormitory, the Tholos, and the temple of Artemis. Kabbadias, who conducts the excavations, concludes, from the architectural remains of the temple of Æsculapius, that it was built about the end of the fifth century, B. C., by followers of the school of Pheidias, among whom was numbered the artist, Thrasymedes, the sculptor of the famous statue of the god in the temple. This statue was of gold and ivory, and represented the deity of superhuman size, seated upon a throne, and holding in one hand a staff, while the other rested on the head of a serpent. A dog lay beside him.§ Although Apollo, the reputed father of Æsculapius, was habitually represented without a beard, the son was commonly depicted with a full beard. At Epidaurus it was of gold, and gave occasion to the sacrilegious Dionysius, of

* Paus., ii., 27.
† Paus., ii., 27.
‡ Athenaion, ix., p. 464.
§ Paus., ii., 27.

Syracuse, for the utterance of a bon mot, as well as for filling his pockets. At Olympia he had carried away the gold mantle of the statue of Zeus, because, as he said, gold was too heavy in summer and too cold in winter; and at Epidaurus he removed the gold beard, remarking that it did not become a son to wear a beard, while his father was everywhere deprived of it.*

The Æsculapian scene in the Plutus of Aristophanes has generally been supposed to be a sheer fantasy of the poet's brain, concocted to ridicule the priestly cures in the temples; and Madame Dacier thought that the pretended god, with his daughters in the vision of Carion, was the priest with a bevy of prostitutes. It remained for Kabbadias to show that Aristophanes was rather describing a genuine religious belief of his day, and that his satire here was of the same nature as that which he poured out upon many other deities, and is to be compared with the Miracle Plays of the Middle Ages. In fact, his treatment of Æsculapius is far more dignified than his treatment of Bacchus in the Frogs, or all the gods in the Birds. He represents Carion as seeing what we find elsewhere dreamed.

Strabo, in speaking of Epidaurus,† says that it is a famous place, especially on account of the epiphany of Æsculapius, who is believed to heal all manner of diseases, and has a temple full always of the sick, and of consecrated tablets on which the cures are inscribed, just as at Cos and Tricca. Pausanias adds more in detail:‡ "Within the precinct of Epidaurus there stand six slabs though there were more in ancient days, upon which are inscribed the names of men and women who have been cured by Æsculapius, and the malady also with which each suffered, and how they were cured. The inscription is in the Doric dialect." As Kabbadias§ was digging on the north side of the temple, at a distance of about 24 feet, he discovered a building 250 by 32 feet, with an Ionic stoa facing the temple, which proved

* Cic. de Nat. Deor., iii., 34, 83.
† Strab., 374. ‡ Paus., ii., 27.
§ Ephemeris Archaiologike, 1883, pp. 197-238.

to be the ancient Dormitory. Within this he struck upon the wall of a mediæval house, among whose stones he found more than twenty pieces of inscribed slabs, nine of which fitted together, and formed a slab so complete that the small losses can be filled by conjecture with great certainty. The other fragments are withheld from publication, for the most part, in the hopes that the slab to which they belong may be completed by further excavations. The height of the complete slab is 6 feet, width 2½, thickness, about 7 inches. The material is a grayish lithographic stone, especially selected, as it would seem, for its extreme fineness of grain and remarkable adaptability for receiving and preserving an inscription. None of the ordinary inscriptions found about the ruins are written on such stone. The front side is smoothed with great nicety, but the back is left rough, as if placed against a wall. Near by was found a base with a channel into which the slab was probably set and fitted with lead, to hold it upright. The inscription consists of 126 lines in the Doric dialect, and its contents prove at once that we have before us one of the stelæ mentioned by Pausanias. It read as follows:

> "God (be with us). Good fortune (attend).
> Cures performed by Apollo and Æsculapius.

Cleo five years with child.—This woman being already five years with child came to the god as suppliant, and slept in the Abaton (Dormitory), and as soon as she had gone forth from this, and was beyond the temple grounds, she gave birth to a boy, who, immediately after his birth, of his own accord, washed himself in the fountain and walked about with his mother. Meeting with such good fortune, she had inscribed upon her offering:

> "Not at the size of my tablet wonder, but more at the marvel.
> Cleo for five long years was bearing the weight of her burden,
> Till in the temple she slept, whence as a mother she went."

A three years' child.—Ithmonica of Pellana came to the temple for offspring, and having lain down to sleep she saw a vision. It seemed to her that she asked the god that she might become pregnant of a daughter, and Æsculapius re-

plied that she should become pregnant, and if there was anything further she desired, it should be granted to her; but she said that she wished nothing more. Afterwards, having become pregnant she carried the child for three years, till finally she came to the god as suppliant for delivery. On lying down to sleep she saw a vision; she thought the god asked her if she had not all she had asked for, and was she not pregnant; for she had said nothing about delivery, and that, too, though he had inquired if there was nothing else she wanted, and told her he would grant it; but as she had come as suppliant for this at last, he said he would grant it to her. Then going hastily out of the Abaton, as soon as she was beyond the sacred limits she gave birth to a girl."

The belief in delayed births of this kind was evidently very common, and the author of the Hippocratic treatise on the Nature of the Infant,* thinks it necessary to prove that they cannot occur. He says he has heard of them often, and explains the belief among women in their existence, from the fact that the womb becomes distended by wind from the abdomen and the delay of the courses, from which relief comes after a time, and then pregnancy coming on, the time is counted from the outset. But I find no account of any such precocious infants as that of Cleo. Appeal to Æsculapius for a child, we have mentioned also in an hieroglyphic inscription from Egypt, belonging to the first century B. C. The high priest at Memphis prays with his wife for offspring, and a vision appears to him of the god, promising compliance, if he will build some addition to the temple structures. The building is constructed and the child is born.†

"A man with the fingers of his hand paralyzed except one, came to the god as suppliant; but on seeing the tablets in the sanctuary he became incredulous of the cures, and ridiculed the inscriptions. However, he lay down to sleep and saw a vision. He thought that he was playing dice in the temple, and as he was about to make a throw with the die, the god having appeared leaped upon his hand,

* Littré, vii., p. 532. † S. Birch in Archæologia, xxxix., p. 320 seq.

and straightened out his fingers. When the god had stepped off, he seemed to bend his hand together himself, and then extended his fingers one by one. When they were all straightened out, the god asked him if he should still disbelieve the inscriptions on the tablets in the sanctuary. 'No,' he replied. 'Well, then, that you were incredulous before, is no cause for so much fear. To the end that you may be trusting for the future, your fortune,' said he, 'shall be such as the believers.'* At daybreak he went forth cured."

Such lessons to the sceptic and the scoffer were, no doubt, needed at times, but forgiveness follows quick upon repentance. In the next, a woman from Athens, perhaps because she was a woman, and should have been more trusting, receives a slight punishment.

"One-eyed Ambrosia from Athens.—This woman came as a suppliant to the god, and while walking about the sanctuary, ridiculed some of the cures as incredible and impossible—that the blind and halt should be cured by seeing a vision only; but when she slept she saw a vision. She thought the god stood by her, and said that he would indeed cure her, but in return she must consecrate in the sanctuary a pig of silver, as a memorial of her stupidity. Saying this, he parted the eye that was diseased and poured in some lotion. When day came she went forth whole.

A dumb boy came to the sanctuary as suppliant for his voice, and when he had offered the initiatory sacrifices and completed the customary rites, the servitor who carried the sacrificial fire, and was standing by, turning to the father of the boy said: "Do you promise within a year, if you obtain that for which he is come, to offer the proper sacrifices for the cure?" Suddenly the lad exclaimed, "I promise," and his father in astonishment bade him speak again. He did speak again, and from that time was cured.

* The loss of some letters in this passage, and the possibility of different divisions of the letters into words, render the exact language uncertain. Weil (Reinach, in Revue Archéologique, 1884, ii., p. 78) suggests the following, in which the language is smoother, but the affected play of words scarcely harmonizes with the severe simplicity of the remainder of the inscription: "Then, because you were incredulous before about them, though they are not incredible, for the future, said he, let your fortune be incredible."

This story recalls the dumb son of Crœsus, who burst into speech when he saw the Persian soldier about to slay his father.* The case is less incredible than some of the others, and the cure comes before the vision. Aristides declares † that many dumb persons have recovered speech by drinking the water of the sacred spring at Pergamus.

"Pandarus, a Thessalian with marks on his brow.—This man when asleep in the sanctuary saw a vision. The god seemed to him to tie his own fillet over the brands, and to bid him when he was without the Abaton to take off the fillet and consecrate it in the temple. Day dawning, he awoke, took off the fillet, and found his brow cleared of the marks. The fillet he consecrated in the temple." Stigmata is the word in the original which I have translated marks or brands. It is not likely to mean a spot or birthmark, for in the next instance it is called grammata or letters, and would seem to show that Pandarus had been at some time branded,‡ as a slave or otherwise, as was not uncommon, or perhaps tattooed. He appears to have had a neighbor, Echedorus, who was troubled in the same way, and when Pandarus returned home with his brow cleared, Echedorus proposed to try the same experiment, and Pandarus sends money with him as a thank-offering for the god. Hence the stone continues: "How Echedorus received the letters from the brow of Pandarus in addition to his own. This man having received money § from Pandarus to make an offering to the god at Epidaurus, in behalf of the donor who gave the money, in his sleep saw a vision. The god seemed to him to stand by him and ask if he had any money from Pandarus. If so, he should deposit it as an offering in the sanctuary; but he denied that he had received any such thing from him. However, if the god would make him whole, he would get a picture of him painted and would consecrate that. Then the god bound the fillet of Pandarus upon his brands, and bade him when he was gone forth from

* Hdt. i., 85. † Aristides, Dind. i., p. 413.

‡ Aetius, 8, 12; Dioscorides, 2, 95.

§ Coins occur often among the offerings at Athens, C. I. A., ii., 835, 836.

the Abaton to take off the fillet, wash his brow in the fountain, and look into the water. When day came he went forth from the Abaton, took off the fillet, from which the letters had now vanished, looked down into the water and saw that his brow had acquired the brands of Pandarus in addition to his own." The similitude of the punishment of Echedorus here, and that of the thievish Euclides in the Plutus* is striking. The next history exhibits the god in a sportive mood.

"Euphanes, a boy of Epidaurus.—He slept in the sanctuary, for the stone. The god seemed to him to stand by and say, 'What will you give me if I make you whole?' He replied, 'Ten dice.' † The god burst out laughing, and vowed he would cure him. When day came he went forth sound."

"A man came to the god as suppliant, with one eye so far gone that it had eyelids only and nothing beneath them but the empty socket. Now, some of those in the sanctuary spoke of his simplicity in thinking that he would receive his sight, when his eye had no existence whatever, only a cavity. However, a vision appeared in his sleep; he thought the god boiled some kind of a drug, and then drawing his lids apart poured it in. At daybreak he went forth with his eyesight completely restored." Evidently a new eye had been manufactured. The circumstances of the next account, which is a veritable idyl, appear to me to be these: Some gentleman journeying to the shrine has ridden forward in haste at the last, leaving his slave who carried his baggage to trudge along and overtake him at his leisure. The episode is called the Drinking Cup.

"A slave carrying his master's baggage was journeying to the sanctuary. When he had arrived at the Dekastadion, he fell down, and on arising opened his pack and inspected the shattered articles. Seeing that the cup from which his master was accustomed to drink was broken, he was in great distress, and sitting down tried to put the shards together. A wayfarer observing him, exclaimed, 'You un-

* Aristoph. Plut., 716–725.

† Such astragali were consecrated at Athens. C. I. A., ii., 776.

lucky fellow, why are you trying to put that cup together so aimlessly? For not even the Epidaurian Æsculapius could make it whole.' Hearing this the slave put the pieces together into his pack and proceeded to the temple. When he arrived he opened the pack, took out the cup, and found it whole. He told his master all that had been said and done, and the latter consecrated the cup to the god."

Next we have a sort of Peeping Tom of Coventry.

"Æschines, after the suppliants had gone to rest, climbed a tree and peeped over into the Abaton; but, losing his balance, he fell from the tree and struck his eyes on some palings. Being badly injured, and becoming blind, he presented himself as a suppliant to the god, and after a night's sleep was cured."

Next follows a neat bit of surgical work.

"Euippus carried a lance-head six years in his jaw; but, when he had fallen asleep in the sanctuary, the god drew out the lance-head and placed it in his hands. At daybreak he went forth with the lance-head in his hands."

"A man of Torone (in Thrace) that had leeches.—This man saw a vision in his sleep. It seemed to him that the god, having cut open his breast with a knife, took out the leeches, gave them into his hands, and then sewed up his breast again. When day came he went forth with the creatures in his hands, and was cured. He had swallowed them through a device of his stepmother, who had put them into a porridge for him." The Greek never loses a chance for a fling at the stepmother. A somewhat similar operation in surgery we shall meet with again.

"A man with a stone in his privates.—This man saw a vision. It seemed to him that *se cum pulchro puero coire*, and in the act he ejected the stone, and taking it up went out with it in his hands." In the Hippocratic treatise on Diseases,* I find a parallel to this extent: "By giving a purgative to a person with a stone they have driven the stone into the urethra by the force of the purge, so that it was ejected with the urine."

* Littré, vi., p. 154.

"Hermodicus of Lampsacus (on the Hellespont), paralyzed in body.—The god cured this man while he slept, and commanded him, when he went out, to bring as large a stone as he could to the sanctuary, and he brought the one which lies before the Abaton."

"Lame Nicanor.—As he was sitting still in the daytime, a youth snatched away his staff and fled. Leaping up, he gave chase, and from that day was cured."

"A man had his toe cured by a serpent.—This man, suffering severely from a tormenting ulcer in his toe, was brought out after daybreak by the attendants, and placed upon a seat. Thereupon, sleep fell upon him, and a serpent, issuing from the Abaton, healed his toe with his tongue, and when he had done this he glided back into the Abaton. The man was cured when he awoke, and declared that he had seen a vision, in which he thought that a youth of beauteous form applied an ointment to his toe." This resembles the cure of the Aristophanic Plutus, whose eyes are licked by two serpents which the god summons to his aid. Among the offerings in the temple at Athens, are mentioned several representations of serpents in metal.

Next we come to a case which proves beyond question that this is one of the veritable slabs read by Pausanias* when at Epidaurus. In describing the region about Hermione, he says that, by going a certain distance, and turning to the left, "there is the road to Halice. Now Halice, in our time," he continues, "is deserted, but it was once inhabited, and there is a Halicean story on the stelæ at Epidaurus which are inscribed with the cures of Æsculapius. But I know no other trustworthy composition where there is any mention of a city Halice or men of Halice." The story is this:

"Alcetas of Halice.—This man, being blind, had a vision; the god seemed to approach, and open his eyes for him, so that he saw the trees in the precinct plainly. At day-break, he departed whole."

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* Paus., ii., 36. 1.

The next is a case not of Sterling's, but sterling ambrosia.

"Heraeus, of Mitylene.—This man had no hair on his head, but abundance on his chin. Feeling ashamed because others laughed at him, he came to sleep in the sanctuary, and the god anointed his cranium with a preparation, and give him a good head of hair."

The stone closes with the following: "Thuson, of Hermione, a blind boy, had his eyes licked, while awake, by one of the dogs about the temple, and departed cured." The dog here, as the serpent above, is regarded as the agent and servitor of the god. The fragments of the other slab contain another cure of the same kind, as it says: "One of the sacred dogs, with his tongue, healed a boy that had an ulcer on his head." This function of the dog has excited considerable interest and some discussion, and M. Gaidoz has shown* that the belief in the curative powers of the dog's tongue for sores is widespread, from India to the extremity of Europe, and he might have added America, for I have heard of it often in my youth.

This inscription is remarkable not only for its contents but for the extreme simplicity of its language, and the classic repose in recital. There are no rhetorical artifices, or rhetorical exaggerations, such as are met with in later days, but the marvelous tale is told as the sculptured frieze might tell it. The forms of the letters show that they were inscribed upon the stone about the third century, B.C. But the miracles recorded in the histories themselves belong to an earlier period. Their own internal evidence is to the effect that each was originally written, at least in substance, upon an individual tablet, and there remained till they were gathered together, and inscribed in the present permanent form. Something similar is known in the temple at Athens, and in that of Amphiaraus, at Oropus. The cult at Epidaurus must have been quite ancient, and possessed of wonderful vigor at the beginning of the fourth century, when the splendid temple and theatre were built. The latest news from the excavations brings tidings of the discovery of two

* Revue Archéologique, 1884, ii., p. 217, seq.

inscriptions of the sixth century, B. C., the earliest authentic records; but we have one that, we can say with considerable certainty, mounts almost as high. In the fragments of the historian, Hippys of Rhegium, who flourished at the beginning of the fifth century, B. C., occurs the following story, quoted by Ælian,* who adds that it was a case where human skill was powerless:

"A woman had a worm, and the cleverest physicians failed to cure her. Accordingly, she went to Epidaurus and besought the god to succor her malady. The god was not at home. However, the temple servitors laid the woman to sleep where the god was accustomed to heal the suppliants. The woman lay at rest, as she was commanded, and the assistants of the god performed the operation for her cure. They cut off her head from her neck, and one of them put down his hand, and drew out the worm, and a huge monster it was; but he was unable to fit the head on again, in its proper place. Thereupon the god arrived, and was angry with them because they had attempted a task that was beyond their skill. But he, by some invincible and divine power, returned the head to its place, and restored the woman." Now, see what one of the fragments of the second slab says: "Aristagora, of Methana.—She had a worm in her bowels, and slept at Troezene, in the sanctuary of Æsculapius, and saw a vision: she dreamed that the god was not there, but in Epidaurus, and his sons cut off her head, and being unable to put it back again, sent some one to bid Æsculapius come. In the meantime, day comes, and the priest sees† her head severed from the body. The following night, Aristagora saw a vision: she thought the god came to her from Epidaurus, replaced the head upon the neck, and then, cutting open her bowels, took out the worm, and sewed them up again; and after that she was well." The stone evidently presents the elder form of the story, and it is quite probable that the cast of it, as originally given by Hippys, has been altered by those who quoted him.

* Æl., Nat. Hist., ix., 33.

† This is to be understood as referring to a dream of the priest's, no doubt.

Strabo* relates that from the cures inscribed in the consecrations in the temple of Æsculapius at Cos, it is said that Hippocrates trained himself in the medical art. And Pliny† more specifically: "Since it was the custom for those delivered from diseases to inscribe in the temple of the god at Cos what had healed them, that it might assist others in like diseases, Hippocrates is said to have transcribed these records, and, as Varro believes, when the temple was burned, instituted the medical art called clinic." It is evident that our Epidaurian stelæ did not belong to this class at all. The cures are all miraculous, without the intervention of any therapeutic means whatsoever. But that these were employed, at least at a later time, is proved by another inscription, the epigraphic character of which indicates the imperial period. A certain M. Julius Apellas, from over-seas in Caria, says in his offering ‡ that he was often sent for by the god when he fell ill and had attacks of dyspepsia. "On the voyage, while in Ægina, he commanded me," continues the tablet, "not to get angry often; and when I had arrived at the sanctuary, he bade me keep my head muffled for two days while it was rainy, to take bread and cheese before meals, celery with lettuce, to bathe myself without assistance, to exercise in running, take bits of citron soaked in water, rub my ears against the wall in the bath, use swings in the gymnasium, take mud baths in wrestling sand, walk barefoot for exercise before going into the water bath, mix wine with the warm water of the bath, bathe myself alone, but give the fee to the attendant, to sacrifice in common to Æsculapius, Epione and the Eleusinian deities, to take milk with honey; one day when I drank milk alone he said, 'Put honey into your milk to cut it.' And when I besought the god to release me more speedily, I dreamed that after using mustard and salt I went forth cured from the Abaton, and a lad led me with a smoking censer, and the priest, and he told me he would cure me, but I must pay the fee for my recovery. Accordingly I did what I saw in my dream, and on using the salt and mustard moist I felt ill, but while

* Strab., 657. † Nat. Hist., xxix., 2. ‡ Ephem., Arch., 1883, p. 230.

bathing I had no pain. These things for nine days after I came (and the god touched me, both my hands and breast).* On the following day, when I was sacrificing, the flame leaped up and burned my hand, so that blisters were formed. But after a little, my hand became well by continuing to use anise with olive oil. And he told me for the headache (indeed, I was not accustomed to have the headache. At all events, to make a long story short, after the use of the oil I got rid of the headache) to gargle my palate and tonsils with cold water. He bade me also to inscribe these things in all gratitude, and I departed cured."

This inscription bears a striking resemblance to the vagaries of Aristides, though the remedies seem on the whole much better suited to the case. We have the same summons by the god to his sanctuary, the same continual direction in dreams, and many of the same exercises. Bathing is here made great use of, while Aristides was commanded to give it up. No emetics are mentioned, and no purges, so numerous in Aristides, unless the honey so acted. Such records might give some assistance to an Hippocrates. Another inscription† of a late period is somewhat mutilated, but describes how a man comes from Sinope, on the Black Sea, and by the appearance of the god is cured of scrofulous swellings on his neck, and of a cancer.‡ No remedies are mentioned, as it appears. The other records at Epidaurus, so far as published, add nothing further to this branch of our subject.

But a marble tablet now long known,§ and supposed to have come from the temple of Æsculapius on the island in the Tiber at Rome, reads to this effect: "The god commanded a certain Gaius, a blind man, to go to the holy altar and worship, then from the right towards the left, and place five fingers on the altar, then lift his hand and lay it on his

* This laying on of hands, or touch, appears in the Plutus (728), and is mentioned by Solon (Frag. xiii., 62) as the great panacea.

† Ephem. Arch.. pp. 237-8.

‡ The same word is found among the consecrations at Athens. C. I. A., ii., 836.

§ C. I. G., 5980.

eyes. Thereupon he saw perfectly well, and the people stood about and rejoiced with him because virtues were still alive in the time of our Emperor Antoninus." Another named Leucius, sick with the pleurisy and given up by every one, was enjoined to take from the altar some ashes and mix them with wine and lay them on his chest. He was cured. Julianus spit blood and was given up by all. He was commanded to take some seeds of the pine cone from the altar and eat them with honey for three days, and he was saved. Valerius Aper, a blind soldier, was ordered to take blood from a white cock, and, mixing it with honey, to use it as an eye-salve for three days, and he was healed. Fleetwood, an editor of these inscriptions, at the end of the 17th century, thought they were concocted by the pagans, that they might seem to have some miracles to oppose to those of the Christians. We know now that the belief in such miracles and the custom of erecting them on inscribed tablets were old before Christianity was established.

To this day these beliefs are not dead in the Greek world, not to go beyond. The Virgin and the saints have taken the place of Æsculapius and Hygieia. Every year to the island of Tenos in the Archipelago hundreds flock at the approach of the spring festival, whole families coming to adore the Panaghia and solicit her favors. A long paved road leads from the quay up to the sanctuary, over which the women make their way on hands and knees, crossing themselves between the eyes. At the convent they establish themselves wherever they can; the last comers camp outside. So pass a night and a day, till the sacred vigil, like that of Æsculapius, draws on. They pack themselves into the church, and kiss the images wherever they can be reached. The bishop appears, accompanied by the clergy, and the service begins. This consists of interminable litanies and chants in a high nasal tone; the congregation respond amen. At times guns are discharged in the courts. All this is kept up till morning breaks. During the day it is noised about that in the sacred crypts, where the lustral water and the holy relics are found, the Panaghia has per-

formed miracles. A blind man has received his sight, a deaf man hears, a cripple walks with ease, a mad man has recovered his reason. As these favored persons scatter through the town where the faithful are celebrating the festival, mothers offer them their children to be blessed; they touch their garments with awe, the divine visitation is so fresh upon them. The great majority, however, depart as ill as they came, but they carry with them at heart an invincible hope; and the festival of the following year will find them prostrated in the same place, praying with the same fervor, animated by the same faith.*

* Girard, L'Asclépieion d'Athènes.

PRESENTATION OF THE PORTRAIT OF FORDYCE BARKER, M.D., LL.D. (EDIN.).

ADDRESS BY DR. THOMAS M. MARKOE.

IT is my pleasant duty, on this occasion, on behalf of the generous donor, to present to you, Mr. President and Gentlemen, Fellows of the Academy, this beautiful portrait and admirable likeness of our former president, Dr. Fordyce Barker. My office is a very modest one, and is soon discharged. I am here merely as a representative, an ambassador, if you please, charged with a valuable gift which I am here and now to present to the dignified body over which you, sir, so worthily preside.

I must acknowledge some little hesitation in appearing before you to-night, lest it might be considered somewhat presumptuous in me, stranger, as I am, to your hall and to your councils; unknown by voice or face to so many of my auditors, to appear at all on your platform. I have accepted the duty as a friend of all parties, and in undertaking it I felt sure I could entirely rely on your courtesy and kindness, and that, while some more familiar voice and some better known figure might have been more acceptable, yet no one could, better than I, appreciate and interpret to you the generous liberality which has inspired the gift we are here to-night to accept; and I am sure none could feel a more heartfelt gratification at the compliment which your acceptance of this portrait will confer on a dear and much-valued friend.

The gift itself is a costly and valuable one. To us, how-

ever, far above its cost, lies its greater value in what it suggests of warm and kindly appreciation, on the part of the great world outside of our profession, of the aims, the motives, and the achievements of the medical science of to-day. This offering means no chance suggestion, or accidental impulse to do a praiseworthy deed for the sake of merely giving pleasure to friends, or to produce a dramatic effect which might afford society a topic of pleasant conversation. It means much more. It means a well-considered and intelligent conviction of the worthiness, and reliability, and ultimate success of our efforts for the relief of human suffering, and a most gratifying assurance that those efforts are, at least in some degree, appreciated by an interested and generous public. In this point of view, it seems to me that this beautiful and appropriate tribute may fairly be accepted as marking a favorable public sentiment, which is as flattering to our professional pride as this testimonial of it is gratifying to our personal feelings. In pleasing ourselves, however, with this general view of the kindly relations which this occasion emphasizes between the profession and the public, we must not for a moment overlook the testimony it bears to the personal regards of the distinguished giver. The same generous hand which has now adorned our gallery with this beautiful portrait, has in years not long gone by enriched our guild with the graceful "loving cup," the token of peace and harmony, in which we drink to concord and enduring friendship among ourselves. I am sure I voice a unanimous sentiment when I offer our heartiest thanks to Mrs. J. J. Astor for this valuable and appropriate gift to the Academy.

This counterfeit presentment of our eminent associate is now to grace the walls of this assembly room, taking its place among a group of faces which the Academy cherishes, as of those whom it delights to honor. There smile upon us from these walls the faces of many, alas how many! who have gone from us, leaving their noble record as an inheritance, by which we are enriched indeed. There are some who still remain, to lend us their mature council, and guide us in our sometimes difficult way. One stands con-

spicuous, as the only rival of our recent president in the length of time he has served us in the highest office within our gift, whose blameless life and devoted loyalty to the highest standards of professional honor, mark him as the Nestor of our profession. May he be long spared to adorn it.

Our thoughts to-night, however, are on the present rather than on the past, and on him whom we are about to honor, rather than on those whose loved memories reflect such high honor upon us. This is not the occasion, nor has the time yet arrived, when our esteemed friend's eulogy may be fitly spoken. "*Finis coronat opus.*" May it be long before that coronation day arrives. But this is the place, and this is an appropriate time, when we may recall the happy relations he has borne to us as our presiding officer, through what has certainly been the most anxious and critical period in the history of the Academy. Not hesitating to avow himself a partisan, and even a leading champion of the cause he believed to be right, yet his high sense of honor, a clear appreciation of what was just and fair toward each of the bitter factions into which, unfortunately, our camp was divided, gave him so entirely the confidence of both, that he was able, with a courageous but impartial hand, to mollify the rancor and moderate the excesses of both sides in the arena of debate, and, in my judgment, largely to contribute to the peaceful and final settlement of the burning questions in dispute on the only basis upon which such questions can ever be settled, namely, a willingness to concede sincerity of conviction to those who are opposed to us, and a manly and honest consent to a friendly disagreement, where cordial agreement has become impossible. I feel sure that my audience will concede this much to a man whose personal relations to the struggle were never, for a moment, left in doubt, and whose convictions were so clear as to make him a tower of strength to the side he so warmly espoused, and to which victory was finally awarded. That this estimate of his course and character was substantially that of the whole Academy, subsequent events clearly demonstrated.

When, in an evil hour, influenced by motives which we do not care to analyze, and urged with a well-planned and deliberate purpose, which seemed strongly to savor of bitter personal ill-will, charges were formally brought against our president by a number of fellows who had collected their evidence with infinite pains, both here and abroad, and who, it must be acknowledged, presented their damaging accusations with admirable skill and telling minuteness of detail, it did seem to all of us that a crisis in the affairs of the Academy, and one of a most serious nature, had really come upon us. If the accused, occupying the conspicuous position he held, had really been guilty of deliberate falsification, and had profited for so many years by the results of his gross deception, the question might well be asked, Who, then, can be trusted? With what calm, unimpassioned completeness he met these baseless fabrications, and with what unanswerable documentary evidence he utterly refuted them, must be fresh in the memory of all. That he should have been acquitted—triumphantly acquitted—by a unanimous vote, was due to the plain, convincing, and perfect proof which his own simple narrative afforded, and to the calm good sense of the Academy, which immediately perceived its justice. But the universal and heartfelt applause which followed the announcement of the verdict, the outspoken pleasure at the vindication of a friend, and the warm congratulations expressed on all sides and by all parties, were, and no one could fail to see that they were, testimonials of hearty good-will toward a man, and gratification that one so high in their regard should have emerged so triumphantly from what seemed to them so cruel, so heartless, and so perfectly unnecessary an arraignment. But enough of this. My own feelings have led me, perhaps, too far in dwelling upon these personal considerations, and I forbear.

The ceremony of the occasion, Mr. President and Gentlemen, is over. You are now the possessors of this beautiful addition to your already rich collection. It is a worthy admission into a goodly company, and as I look around on these faces, so closely associated with my earliest and best

impressions of professional life, I cannot help pleasing myself with the thought that, long years hence, it may be, as our children or grandchildren, curiously scanning the faces of the noble group, ask who was this and who was that, some white-haired relic of the present assembly may say, "This is the portrait of one of our most eminent and of our best beloved presidents, *Dr. Fordyce Barker*."

The chaste, kind, expressive, and yet uncompromising language of the presentation address was listened to with that profound silence which comes only with deep and heartfelt interest in the welfare of a tried friend and brother, and which bursts into spontaneous applause when the spell is broken.

THE PRESIDENT accepted, in behalf of the Academy, the beautiful gift as a well-merited homage from the midst of an intelligent and high-minded public interested in the prosperity of the medical profession, and expressed his gratification in the fact that it came from one by whom the material interests of the Academy had heretofore been liberally and kindly advanced. The gift was continued proof that the public takes an interest in the medical profession, and when it took an interest in the best of the profession the best interests of the public were very much enhanced.

DR. ALFRED C. POST moved that the thanks of the Academy be presented to the donor for this valuable gift and unusually beautiful work of art. Unanimously carried.

DR. HEINEMAN moved that the thanks of the Academy be tendered to Professor Markoe for his kind and beautiful presentation address. Unanimously carried.

A NEW OPERATION FOR THE CURE OF RUPTURE OF THE PERINEUM.*

By ALFRED C. POST, M.D., LL.D.

THE operation which I propose differs from those in ordinary use, in the fact that it involves no loss of substance, and that, if from any cause, it fails to accomplish its object, it may be repeated with a better prospect of success than if any portion of the tissues involved had been sacrificed. It is also performed with more ease, and occupies less time in its performance than the ordinary operation. It forms a thick and strong perineal body, giving a firm support to the part which rests upon it.

The operation is performed in the following manner. A deep incision is made on each side of the vulva, just in front of the normal situation of the anterior margin of the perineum, and is continued to the margin of the anus, if the fissure extend as far back. If not, the two lateral incisions are joined in front of the anus. By these incisions the tissues on each side of the fissure are divided into a superior and an inferior layer. The two superior flaps are turned up so that their cutaneous surfaces meet and form a ridge on the floor of the vagina, being joined together by a continuous catgut suture. At the junction of the superior and inferior flaps, a deep row of silver sutures is past, and the ends of the wires, being passed through beads or leaden clamps,

* Read before the New York Academy of Medicine, April 2, 1885.

are secured by perforated shot passed over them and closed with pincers. The lower flaps are thus turned downward, so as to form a ridge in the perineum, and are joined together by a continuous silk or catgut suture. The triple row of sutures, employed in this way, secures the union of the broad surfaces which are approximated, and gives firmness and stability to the reconstructed perineum.

I have not had the opportunity to test this operation in a large number of cases, but on the three occasions on which I have performed it, the results have been satisfactory. I would recommend its performance to those who have more frequent opportunities of testing it, and if its results shall be as satisfactory to others, as they have been to myself, the operation will occupy an established position among the resources of our art.

ENDOMETRITIS FUNGOSA; ITS PATHOLOGY, DIAGNOSIS, AND TREATMENT.*

By JAMES B. HUNTER, M.D.,

SURGEON TO THE WOMAN'S HOSPITAL, NEW YORK; PROFESSOR OF GYNECOLOGY IN THE NEW YORK POLYCLINIC, ETC.

THE disease known to us as endometritis fungosa was described by Robert, a pupil of Récamier (*Bul. Thérapeut.*, 1846, tome 21). Récamier himself wrote on the subject, under the title of "Fongositées Utérines," in 1850 (*Union Méd. de Paris*, tome 1, 1850). In 1848 Robin (*Arch. Gén. de Médicine*, xvii.) said of these fungosities: "They are, from an anatomical standpoint, simple vegetations from the uterine mucous membrane, having therefore the same anatomical composition, and enclosing fibroplastic tissue."

Rouyer ("Thèse de Paris, 1848") says: "The fragments made with a curette are generally from three to five centimetres long; from five to six millimetres wide, and from one to five millimetres thick. Their free surface is smooth, and covered with epithelium; the tissue is very vascular. In this hypertrophied mucous membrane there appear granular forms of three kinds, viz.: 1, Granules which resemble small gooseberry seeds, and are opaque or transparent—these raise up the mucous membrane, and form white spherical, almost sessile, projections; 2, masses of a spongy character, like placental tissue; 3, granules about as large as the head of a pin, which are seen *beneath* the mucous membrane.

* Read before the New York Academy of Medicine.

These may attain the size of a pea, and resemble the forms described, except that they are more numerous and regularly distributed.

Nélaton (*Gazette des Hopitaux*, 1853, No. 17), states that fungosities have two surfaces—a free surface, which is of a rosy red color, and growths resembling the intestinal villi, and an attached surface, the latter having a deep red shade, and suggesting freshly torn tissue.

Ferrier ("Thèse de Paris, 1853") had an opportunity to observe these growths *in situ*, on several occasions, in the dead-house. He describes them as small, spongy, pulpy masses, red or rose-colored, soft, easily detached with the finger-nail, with or without pedicles.

Goldschmidt ("Thèse de Strasburg, 1859") states that Koeberlé found them fifteen times in the cadaver.

Richet, Robert, and Nélaton all took opportunities to study this condition at autopsies. For the gross pathology of this affection we are indebted largely to early French observers, and some after them recognized its nature quite clearly. The German authorities have investigated more thoroughly the microscopical anatomy of the subject; Olshausen (*Archiv f. Gynakologie*, vol. viii., No. 1) having contributed the most important paper.

Among those who have written on the subject are Aran ("Mal. de l'Utérus"); Courty ("Mal. de l'Utérus"); Gallard, Ruge and Veit; Nonat ("Mal. de l'Utérus"); and Winckel, under the title of "Adenoma Papillosum Diffusum Corporis Uteri." The disease does not seem to have been studied or appreciated by the English authorities. In this country it has long been recognized and successfully treated.

There is some confusion as to the term "fungosity." Olshausen writes of "endometritis hyperplastica chronica vel polyposa;" Hegar and Kaltenbach include the condition under "endometritis;" Weber refers to it as "endometritis hemorrhagica;" Slavjansky employs the term "metritis villosa;" Courty treats of granulations and fungosities, and considers fungosities a developement of granulations. Throughout his whole chapter on this subject, Courty singularly con-

founds fungosities of the uterine cavity with erosions, and with hypertrophy of the follicles of the cervix. According to my experience fungosities proper are never found in the canal of the cervix, though often abundant just above the boundary line between the cervix and the body of the uterus. They are certainly never found, as Courty seems to believe, "commencing at the os uteri."

Pathology.—If the lining membrane of a uterus which is the subject of fungosities be gently scraped with a blunt curette there will appear, together with some blood-clots, a number of small, pink, firmly organized bodies, sometimes gelatinous, resembling small polypi, and varying from the size of a pin's head to that of a small pea. I have seldom found them to exceed five millimetres in size, and, as a rule, they are much smaller. They cannot be easily broken down by the finger, and are very easily distinguished from blood-clots when put into water. Neither the size of these growths nor their number is in proportion to the amount of hemorrhage to which they may give rise. The scraping, if carried over the whole surface of the uterus, will generally exhibit a few whole fungosities and a quantity of fragments, mixed with blood-clots. The true fungosity is always of a pale pink color after removal, but is probably congested while attached to the mucous membrane of the uterus, as the structure is highly vascular. Aran divides fungosities into sessile tumors, with broad bases, and pediculated or polypoid masses. Mundé (*Edin. Med. Jour.*, April, 1878) speaks of three varieties, including "uniform hyperplasia of the entire mucous membrane," which, pathologically speaking, is questionable. The difference between sessile and pediculated fungosities is one of form only. All fungosities consist essentially of a hypertrophy of the mucous membrane, in the form of papillary growths having a distinct fibrous basis, and covered by a single layer of cylindrical epithelial cells. I have examined a large number of specimens microscopically, and have often found these characteristics so distinct, and accompanied by so great an increase in the size of follicles, as to offer some ground for considering them new

specimens, which might be regarded as adeno-papillomata. The abundant vascular supply of these fungosities has been well described by Olshausen, who also notes the constant presence of numbers of leucocytes, which not only crowd the interstices of the fibrous tissue which forms the bulk of the fungosities, but are also found abundantly in the surrounding mucous membrane. The presence of these white blood-corpuscles in unstained specimens often gives an appearance which it is extremely difficult to distinguish from that of round-celled sarcoma. De Sinéty (Paris, 1879) is the only author who has laid stress upon the close resemblance of fungosities to true granulation tissue. He says: "In other cases the fungosities are specially constituted of embryonic tissue with few blood-vessels. There are only traces of the glands, and some remains of more or less degenerated epithelium. We have then to do with a truly inflammatory tissue, and comparable to that which remains upon an exposed wound. At certain points there are islands of degenerated elements which are not colored by reagents, and are analogous to those observed in foci producing pus." This statement is important, as showing that we have to deal with something more than simple hypertrophy. Thomas, in using the term "fungous degeneration," does not mean to imply that there is any process akin to degeneration in the development of fungosities, which are really local hypertrophies of the uterine mucous membrane. Fungosities are never friable, and never show evidences of degeneration. They are not homogeneous on section, and contain a good deal of fibrous tissue.

The question naturally arises, why the hemorrhage should be so great, as we know it to be clinically, from a cause apparently so trifling. The amount of hemorrhage will not appear excessive if we consider the extent of surface from which it springs. In normal menstruation the escape of blood occurs because of the fatty degeneration of a portion or of the whole of the epithelial lining of the uterus (Kundrat, Leopold, Engelmann.) The epithelial covering of these fungosities probably undergoes the same change as that of

the rest of the mucous membrane. The surface of this fungosity measures ninety-six inches; so that it is evident that the superficial area of the cavity of the uterus may be enormously increased by the existence of a small number of fungous growths. The extreme vascularity of the growths under consideration is not apparent in sections of specimens that have not been injected. The opportunity for obtaining such specimens is very rare. The question of the cause of the prominent symptom, hemorrhage, has been avoided by all the authors I have consulted who have written on this subject.

Microscopic appearances.—The actual appearance of these growths under the microscope has not been satisfactorily described, notwithstanding the vital importance of distinguishing between endometritis fungosa and malignant disease of the uterus. Unaided by the history and clinical features of a given case it is not always possible, by the microscope, from a single small specimen, to make an absolute diagnosis, even for the most experienced microscopists. In a typical case, and under favorable circumstances, there would be little difficulty in doing so. While a diagnosis of sarcoma or epithelioma may often be made from the examination of a single specimen, it may be necessary to examine a number of specimens in order to certainly exclude those diseases and pronounce a diagnosis of an innocent affection.

The papillomatous masses are absolutely characteristic of fungosities, even if there should be no enlarged glands and other appearances characteristic of uterine mucous membrane. This, taken in connection with the amount of fibrous tissue, the glands, etc., will generally suffice for a diagnosis. On staining, the smaller size and irregular distribution of the leucocytes will exclude sarcomatous tissue. In cases where characteristic sections cannot be obtained the diagnosis must be guarded.

According to Olshausen, microscopical examination shows a greatly hypertrophied mucous membrane with increase of all its elements, dilated follicles, enlarged blood-vessels, and great cell infiltration of all the connective-tissue. There

are large dilated blood-vessels, and around them many white blood-corpuscles. Around the follicles are spindle-cells arranged in regular lines. "These," he says, "prove the chronicity of the affection."

I have quite recently had an opportunity of examining, post-mortem, a perfect specimen of fungosities *in situ* that presented the appearance of very small dentritic masses, pale and shrunken, covering the greater part of the anterior wall of the uterus. A number of sections made by Dr. H. C. Coe, through the entire uterine wall of a similar case, including the basis of the growths, showed conclusively that there was no line of demarcation between the normal hypertrophied tissue, but that the uterine mucous membrane was continuous with that covering the fungoid masses. The submucous connective-tissue extended directly into the masses, giving an appearance suggestive of the benign growths in the bladder figured by Thompson as "fibro-papillomata."

Important as the microscope is to enable us to form a diagnosis of this affection, much care and patience is necessary in its use. A hasty examination of a single section, especially a fresh one, is by no means sufficient. Specimens should be examined both fresh, and also hardened in alcohol, and stained. At least a dozen different sections should be looked over carefully and compared with each other, or other specimens and plates. Such an examination, together with the history of the case, will generally enable us to make a positive diagnosis.

Symptoms.—The principal symptom of this form of endometritis is menorrhagia. Rouyer makes the questionable statement that pain is always present, and that it is generally unilateral, radiating from the iliac region to the sacrum and hip of the corresponding side. I have found pain to be rare as a consequence of the existence of fungosities. As a rule, the hemorrhage consequent upon fungous growths is a menorrhagia—that is, it consists in an increase of the quantity of the normal menstrual flow, and especially in a lengthening of the period, which instead of five may last eight or ten

days or more. In sarcoma there is generally a metrorrhagia, which occurs independently of the menstrual period, and which often breaks up entirely the menstrual rhythm. A long train of symptoms follow, but they are in nowise different from those common to anæmia from other cases.

In some cases there is in place of hemorrhage a constant discharge of serum, perhaps only tinged with blood. The subjects of such watery discharges lose flesh and strength and become anæmic, as though the loss were of blood.

According to Olshausen the increased flow due to fungosities often comes on suddenly in women previously healthy, and causes an anæmia, as a result of which there is an absence of menstruation for several months. This is directly contrary to my experience.

Lusk reports a case (*Am. Jour. of Obstet.*, January, 1878) which died from progressive cachexia, probably from the existence of fungosities. Dr. M. D. Mann, who examined the uterus, post-mortem, pronounced the case one of "villous degeneration of the uterine mucous membrane." He says of the specimen examined (Trans. Obstet. Soc., *Am. Jour. Obstet.*, January, 1878, p. 133), "it consists histologically of structureless basement substance containing great quantities of small round cells and nuclei, and portions of uterine follicles and vessels."

Etiology.—The growth of fungosities seems to be generally a result of chronic congestion of the uterus. It is commonly found in cases of subinvolution. In unmarried women it is often a consequence of neglected retroversion or retroflexion. In cases of laceration of the cervix, where there is much hypertrophy of tissue, there is commonly an interference with the circulation, which, if sufficiently prolonged, promotes these vascular growths from the endometrium. They seem to result from a moderate amount of congestion, as from a mild form of endometritis, long continued, rather than from the more severe or acute forms of that disease. They have no connection whatever with gonorrhœal or syphilitic infection, as far as I have been able to ascertain. They occur usually during the child-bearing period, but may

be found before and after that time. It is some aid in diagnosis to remember that sarcoma, as a rule, does not occur till between thirty-five and forty.

One of the causes of hyperæmia of the uterus is the existence of fibroid tumors in connection with that organ. Hence fungosities are often found associated with fibroid tumors, and in some cases are the chief cause of excessive hemorrhage. They should always be suspected in cases of fibroids, as their removal may be of great temporary benefit to the patient.

Differential diagnosis.—The conditions with which fungosities are liable to be confounded are:

1. Benign growths, *A.* Submucous polypus; *B.* Adenoma of the uterus; *C.* Benign papillomata; *D.* Villous degeneration of the endometrium; *E.* Placental or decidual remains.

2. Malignant growths, *A.* Carcinoma of the body of the uterus; *B.* Round celled (or diffused) sarcoma.

Benign Growths.—*A.* Fragments of soft myxomatous polypi removed from the uterine cavity sometimes resemble fungosities on gross inspection. Under the microscope the loose fibro-muscular tissue, the enclosing layer of epithelial cells, the enlarged blood-cells, and the free leucocytes give an appearance which might easily be mistaken. A few stained sections of the suspicious masses will bring out the well-marked papillary remains, and clear up the diagnosis. The rare form known as "channelled polypus" is distinguished by the presence of a large number of cavities of a size never seen in true fungosities. Klob describes a vesicular polypus which seems to be of the same character as the variety just named. Polypi are more limited in number, and more localized. They are often found in the cervix, while fungosities are not.

B. Adenoma of the uterus is a rare condition, and the descriptions of it are vague. Savage seems to regard it as not uncommon, but he evidently confounds it with fungosities.

C. True benign papillomata are said to be confined to the cervix, while fungosities are, in the opinion of all authors

except Courty, limited to the body of the uterus. The microscopical differentiation of these two conditions would be difficult, if not impossible. It is a question whether some of the large fungoid growths should not be regarded as true morbid growths rather than simple hypertrophies.

D. Goodell refers to a condition which he calls villous degeneration of the endometrium, the same being described by Hirschfeld as "cylindrical cell adenoma," and by Winkel as "adenoma papillosum diffusum corpus uteri." The cases described by Goodell were probably either villous cancer or simple fungosities.

E. The diagnosis of fragments of placental polypi or retained decidual remains is not easy. The embryonic cells of fœtal remains are larger than those covering the fungoid masses. The cells covering fungoid masses are cylindrical, and the connective-tissue basis is firmer and more pronounced than in the chorionic villi. The latter are generally longer and more delicate, and have clubbed rather than accuminate extremities.

Malignant Growths.—A. Epithelial or medullary carcinoma of the body of the uterus is so different in its history, and so different microscopically, that there is little danger of confusion. The cells of an epithelial type, infiltration, excessive degeneration, alveoli, fragments, etc., are sufficient to make the diagnosis of carcinoma easy.

B. Round-celled sarcoma of the uterine mucous membrane is more likely to be mistaken for fungosities than any other condition. Sarcoma of the body of the uterus is not so exceedingly rare as it is stated to be by Dr. Mundé in his article already quoted, in which he says that Schroeder has found only sixteen cases reported in literature. I have seen seven cases in my own practice, and in that of Dr. Thomas, in the Woman's Hospital and elsewhere, I have seen twice as many. Dr. Coe, Pathologist to the Woman's Hospital, has examined six cases, in which there could be no doubt of the diagnosis, within the present year. Mundé believes that localized fibro-sarcoma (the hard variety) is the more frequent. In this my own experience is not in accordance

with his. I believe sarcoma is not so very uncommon, but that it is often overlooked; and it should always be suspected in cases where we exclude fungosities and carcinoma. The symptoms of sarcoma may be very similar. Virchow ("Onkologie," vol. ii., p. 350) thinks many innocent hyperplasiæ of the mucous membrane are mistaken for sarcoma, but he gives no differential diagnosis. In sarcoma scraping generally yields a considerable quantity of soft, brain-like material, breaking down readily upon handling, homogeneous on section, frequently showing marked degeneration (pus, etc.). It never appears in distinct formations, but the fragments are always irregular in shape, whatever their size may be. The difference is marked, even to the naked eye, and is rendered very distinct by a lens of low power.

Microscopically sarcomatous tissue is homogeneous in appearance, being entirely made up of round cells with a fine stroma. The cells are mostly somewhat larger than leucocytes and have a large central nucleus. Transitional forms, "alveolar sarcoma," "sarcoma carcinomatodes," may be found in the uterus, the cells assuming an epithelial type, and being arranged in alveoli. These appearances are of course never seen in fungosities. In the examination of fresh and unstained specimens there is a liability of error, because in both cases the field is filled with masses of round cells.

DIFFERENTIAL DIAGNOSIS.

Symptoms.

Fungosities.	*Sarcoma.*
Little or no pain.	Considerable pain.
Menorrhagia the rule, metrorrhagia the exception.	Menorrhagia and metrorrhagia usual.
Discharge generally odorless.	Discharge often offensive.

Gross Appearances.

Fungosities.	*Sarcoma.*
Pale pink color, semi-transparent, sometimes gelatinous.	Grayish white, brain-like.
Distinct formations, of firm consistency; undergo no degeneration.	Soft, friable, amorphous, and prone to degeneration.

Microscopical Appearances.

Single layer of normal columnar epithelium and irregular groups of leucocytes.	Structure entirely cellular, single nuclei.
Stroma considerable and not intercellular.	Stroma slight and intercellular.
Papillomatous arrangement.	No papillomatous arrangement.
No infiltration of healthy tissue.	Healthy tissue invaded.
Surrounding mucous membrane normal.	Surrounding mucous membrane destroyed.

Clinical differences between fungosities and sarcoma.—The thorough use of the curette in cases of fungosities is followed by little or no hemorrhage. If the case is one of sarcoma, there is apt to be much bleeding for several days after the use of the curette, the condition of the patient is aggravated rather than improved, and there may be considerable pain lasting for several days. In cases of simple fungosities, if they are thoroughly removed by the curette, and if the cause of the congestion of the mucous membrane be remedied, the patient is often permanently cured after a few months. In sarcoma similar treatment is of no avail whatever to arrest the tendency to hemorrhage, nor does the patient in the latter case improve much under tonics, food, and general hygienic measures. Fungosities recur after six or eight months if the original cause remains, but for a period the patient is free from hemorrhage, and gains health rapidly. Sarcoma recurs after removal, and after mere scraping with a blunt curette it often assumes a rapid growth.

Treatment.—The disease having been recognized and a positive diagnosis made, the treatment of the existing condition the fungosities—is very simple and satisfactory. The cure of the condition that gives rise to a hyperæmic condition of the uterus is a very different and much more tedious affair, and must obviously be adapted to each individual case.

It is not usually necessary to dilate the canal of the cervix in order to use the curette. The presence of any growth or body within the uterus tends to cause a patulous condi-

tion of the cervical canal.' The operation of curetting should be done under the influence of ether. The patient being on the side, a Sims speculum is introduced, and the canal of the uterus is cleansed by the use of cotton on the ordinary applicators. The whole surface of the uterus is then gently scraped with the blunt curette, the curve of the instrument being changed so as to enable every part of the cavity to be reached. Cotton should again be used to remove the loose fungosities and to cleanse the uterus. An application of the strong tincture of iodine (Churchill's), or of strong carbolic acid, should then be made to the whole surface, a little absorbent cotton placed in the vagina, and the patient put directly to bed, where she should remain for two days, or longer if there be any pain.

The operation may be done without anæsthetics, but is almost always painful, and it is not likely to be done so thoroughly.

Apart from the effect of the curette on the growths in the cavity of the uterus, it has an excellent effect on the congested uterine mucous membrane, and has been recommended as a means of cure. Dürelius, assistant to Martin, of Berlin, reports sixty cases of pregnancy, occurring in women who had been curetted—forty-nine of them for endometritis.

Dr. Clinton Cushing, of San Francisco (*Western Lancet*, August, 1882, p. 340), recommends the blunt curette in the treatment of hemorrhage from congestion of the uterus, and considers it especially valuable in cases of hyperplasia of the body of the uterus, or subinvolution, its use in such cases being followed by marked improvement.

Patients should be warned not to expect immediate improvement. The first period after curetting is often quite profuse, and it is not till the second or third that there is marked improvement.

If done only in suitable cases, with due preparation, proper regard to cleanliness, and with antiseptic precautions, and if the patient is put in bed immediately afterward, and kept quiet by morphine if there is much pain, I consider the

operation of curetting little more hazardous than the passage of the uterine sound, which in certain rare cases has proved exceedingly dangerous.

Contra-indications.—The curette is on no account to be used in case of recent pelvic inflammation or any degree of parametritis. Nor should it be used without thorough preparation in cases where the uterus is so sensitive that it will not tolerate the passage of the smallest probe. Such cases should be prepared by the abundant use of hot water, and should be watched very closely after the operation.

The curette.—A few words in conclusion as to the instrument known as the curette.

Récamier's curette, though not described by him in his article on fungosities in 1850, was doubtless a cutting instrument. It was first a steel scoop, and afterward a loop of flat steel, sharpened on each side. It has recently been claimed in England that Récamier's instrument was blunt, but no evidence is given in support of the statement. Récamier speaks of it himself as the *sonde curette*, and speaks of taking out with it a tablespoonful of fungosities. He refers to the operation as *la cathéterisme utérine*. He speaks of having first used the curette, and then having applied the cautery, and also of having had unpleasant symptoms afterward. He reports the removal of a fibrous polypus by means of his instrument. The introduction of the curette met with much opposition, and Récamier seems inclined either to apologize for it, or to stand on the defensive.

Trousseau (*Gazette des Hopiteaux*, 1856) says the instrument was so sharp that Récamier perforated the uterus with it on three occasions.

Olshausen condemns Récamier's instrument as dangerous, and recommends that of Sims; he speaks of Récamier as being very harsh in his methods.

Both Sims' and Simon's curettes were of steel, and had sharp cutting edges. About the year 1870 Dr. Thomas devised the blunt curette, and with slight modifications in shape that instrument has been very generally adopted in this country. It has nothing in common with the sharp

curette except the name. The name being derived from the French verb *curer*, to cleanse, is more appropriate to this instrument than to one capable of cutting. The introduction of this blunt curette has made the treatment of ordinary fungosities safe and simple.

For general purposes the blunt curette should be of two sizes. The smaller one is an oval loop, one-fourth of an inch wide, outside measurement. This used chiefly for diagnostic purposes. The larger one is three-eighths of an inch wide. Both are made of copper or soft metal, with a shank that can be adapted to the curve of the uterine canal, the entire handle being nine inches long. For obstetrical purposes they are made larger, and with much longer handles. Many modifications of the blunt curette have been recommended, but the bluntness is the essential feature of Thomas' instrument, and so long as that is preserved the precise shape of the instrument is of little consequence, provided it will reach every portion of the uterine cavity without the use of force. Emmet's curette forceps is a different instrument, and is intended to crush the fungosities without the possibility of danger to the healthy tissue. It was devised to avoid the evils sometimes consequent on even the most careful application of the sharp curette. Those dangers do not belong to the blunt curette, which, as has been said before, with proper care can do no more mischief than the passage of the sound. The therapeutic uses of the blunt curette were fully discussed by Dr. Mundé in a paper published in the *Edinburgh Medical Journal* in 1878. A paper on the same subject was read by Dr. George T. Harrison before the New York State Medical Association, November 19, 1884, and published in the *New York Medical Journal*, December 20, 1884, and is, as far as I know, the latest addition to our scanty literature on this subjeet.

OBSERVATIONS ON THE MEDICAL AND SURGICAL TREATMENT OF PERITONITIS.*

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PERITONITIS may well be regarded as the most fatal of the acute inflammatory diseases. After a careful compilation of various hospital statistics, etc., I think its mortality may be set down, when all varieties of the disease are considered, at about from 50 to 60 per cent., and from 20 to 30 per cent. higher when so called "idiopathic cases" are excluded. Indeed, as is well known, there are certain cases, especially such as are incident to septic poisoning, and others that follow perforation of the bowel, in which under present methods of treatment a fatal termination may be said to be inevitable.

Believing that this mortality is unnecessarily high, and that certain cases of peritonitis are permitted to die, which, perchance, under different procedures might be saved, it is my desire to formulate and emphasize certain principles of treatment already known, although not as yet generally accepted, by the Profession.

All treatment, to rise above mere empiricism, must rest upon a three-fold conception. A conception of the cause of the disease, of the natural history of the disease, and finally a conception of the natural tendencies of the disease or a foreknowledge of the mode of recovery or death. These

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principles apply with special pertinency to the treatment of peritonitis, and before we can expect to treat that disease rationally, we must first know what causes it and then how it kills.

Without going into unnecessary detail, it will suffice to know that peritonitis may originate from *external traumatisms*, from *internal traumatisms;* by extension of inflammation from contiguous parts; from septic causes and certain blood diseases, (as rheumatism, Bright's, etc.); and possibly, though rarely, from causes that are purely miasmatic and climatic, constituting the so-called idiopathic cases.

Now what are the causes of death? According to the text book, collapse and asthenia. According to clinical and pathological observation:

1st. *Collapse*, which represents the shock received by the nervous system from injury inflicted on the largest serous membrane of the body.

2nd. *Asthenia*, which may be more intelligently expressed by *a*, heart failure; *b*, respiratory failure.

3rd. By inflammatory changes in the lungs.

4th. By inflammatory changes in the kidneys.

5th. By hyper-pyrexia as a special cause superinducing any or all the above.

Any treatment, to be successful, must be prosecuted in the light of the above clinical facts, and, in this understanding, the following considerations are submitted.

1st. The rarity of idiopathic peritonitis being now generally admitted, it is of paramount importance that each case should have its etiology definitely determined at as early a period as possible.

The mere fact that peritonitis exists is not sufficient in itself to justify the adoption of any course of treatment. This primary diagnosis, like the signboard by the wayside, simply points the way to further exploration.

So long as peritonitis is regarded as a finality, rather than as the expression or symptom of some organic disturbance, but little help can be expected from other than a purely empiric line of treatment.

The views of the profession have undergone a great change in this respect. As Dr. Savage tersely puts it, (Brit. Med. Jour., Jan. 31, 1885), "We are learning, if we have not already learned, to look on peritonitis as a symptom of some organic change, and not as a disease in itself. And this is well for our patients, because operative measures can do much for it. We shall ere long regard so-called idiopathic peritonitis almost as a curiosity."

In no other disease is an early knowledge of the causation of the attack so essential, and yet how often is the etiological factor totally ignored in our haste to adopt a course of treatment, which, while it mitigates symptoms and apparently gives relief, at the same time unwarily leads us on to a fatal, though, perchance, a painless finale.

It is in the incipiency of the attack, before excessive tympanites has disturbed the normal configurations of the abdomen, and fatal asthenia has developed, that the golden opportunity for successful diagnoses exists.

One word as to the alleged difficulty of accurate diagnoses under such circumstances. So much has been said on this subject, that they have come to be regarded as well nigh insuperable. Yet under a systematically conducted examination, which necessitates the interrogation of each abdominal viscus, and which seeks to find a satisfactory explanation for each abnormal symptom, it is surprising how the difficulty will disappear. It is to a want of thoroughness in the examination, and a lack of the judicial element in weighing symptoms, rather than to inherent difficulties, often, that the diagnosis seems so obscure. Six times have we seen fatal peritonitis developed after acute perforation of the vermiform appendix, and in five cases out of the six, has the autopsy verified the diagnosis. (N. Y. Med. Jour., Jan., 1881.)

Of nine cases of Intestinal Obstruction that have fallen under our personal observation, two cases have recovered without surgical interference; hence, the diagnosis could not be verified. Of the remaining seven, a positive diagnosis was made in five. Upon three of these I did laparotomy twice with success. The autopsy revealed the correctness

of diagnosis in the remaining two cases. (Transactions N. Y. Co. Med. Soc., Meeting April 7, 1884, page 296.)

These diagnoses were made and the local lesion differentiated under conditions of collapse, tympanitic distension, and abdominal pain, for these are the prominent symptoms ushering in acute peritonitis, and are cited in this connection to show that a diagnosis which is practically accurate is feasible. (For fuller information regarding diagnosis the reader is referred to an article by the author—"On Operative Interference in Acute Perforative Typhlitis"—N. Y. Med. Jour., Jan., 1881.)

2nd. The diagnosis being made and a local lesion amenable to surgical interference being demonstrated, surgical relief should be rendered at the earliest moment practicable.

The peritoneum behaves very differently under different circumstances. It seems scarcely credible that the same structure that will passively submit to the enormous distension of a gravid uterus or an ovarian cyst would reject so summarily the trifling local irritation consequent upon some minute intestinal perforation. Yet such is its behavior under the acute irritation that the rule might well be formulated, that all foreign substances, solid, liquid, or gaseous, of an irritating nature, when introduced into the peritoneal cavity, will inevitably and rapidly produce inflammation. The history of such traumatisms is, as we have shown, most unfortunate, the terrible features of the attack precipitating themselves with a malevolence that is simply appalling.

What, under the circumstances, are the indications for treatment? Were the irritation located elsewhere in the body than in this much-dreaded locality, sound surgical judgment would advise the immediate removal of the irritant. Why, then, should the peritoneum, a region which is daily proving its immunity to surgical manipulation by giving to surgery its brightest triumphs, not be subjected to the same wise principles that guide us elsewhere in our operative procedures?

True, it is no trifling responsibility we assume when we

propose in the very face of a commencing peritonitis to open the cavity of the abdomen, release a strangulated bowel, divide constricting bands, or cleanse the cavity from purulent extravasations; but in view of the exigencies of the situation and the absolute imminence of death, do we shift these responsibilities one iota when we sit supinely by, knowing full well the inevitable fatality that attends the orthodox methods of treatment?

What ovariotomist is there that would hesitate a moment to remove stitches and re-open a wound, in case internal bleeding, or purulent accumulation demanded it? Too well does he know the fatality of temporizing. How many more valuable lives then are yet to be sacrificed before the profession will realize the necessity of surgical interference in these desperate cases of internal abdominal traumatism?

Marion Sims (Brit. Med. Jour., Dec. 17, 1881) in this very hall, sounded the keynote of the future treatment of such cases when he said, "Given a case of perforation of the intestines, and given an accurate diagnosis, which is by no means difficult, what are we to do in the present state of our knowledge? Why, of course, we should open the abdomen promptly, clean out the peritoneal cavity, search for the perforation, pare its edges and bring them together with sutures, and treat the case as we now treat other cases involving the peritoneum. Rest assured," he says, "that the day will come—and it is not far off—when an accurate diagnosis in such cases followed by prompt action will save life that must otherwise quickly ebb away."

Dr. Robert W. Johnson, Chairman of the surgical section of the Medical and Chirurgical Faculty of Maryland, said in his annual report, (N. Y. Med. Record, p. 550) "The greatest triumphs of the year (1884) are in abdominal surgery, Dr. Bull's case of laparotomy and suture of the intestine for gunshot wound being the greatest of them all." He then goes on to state, "The abdomen should be opened in case of perforation of intestine, hæmorrhage, extravasation of fæces and *beginning peritonitis*, just as in cases where internal strangulation has been positively diagnosticated; but

only under full and complete Listerism; first, because without operation, the patient is almost sure to die; second, the danger is far more than counterbalanced by the chances of recovery."

To familiarize myself with the technique of the operation, three times I have laparotized dogs, resected one or more segments of intestine, suturing with catgut the divided gut, and, notwithstanding the difficulty of keeping the animals quiet, they all recovered. I have twice subcutaneously perforated with a slender bistoury the gut of a dog, and, after forcibly squeezing some of the intestinal contents and blood into the peritoneal cavity, I have opened the animal, washed out the abdomen, sutured the perforation, and had one of the dogs recover.

The point raised by Dr. James R. Wood in the discussion on Dr. Sims' paper, to which reference has already been made, viz: that "pathological surgery, or operations done for tumors and disease, was very different in its results from traumatic or acute surgery; and that this was specially true regarding manipulation of a large serous membrane that resents all impertinent interference," does not, it seems to me, afford a sufficiently logical basis for doing or not doing the operation.

As a clinical fact, the peritoneum is exceedingly tolerant of interferences, provided the proper precautions are observed.

In order to show the tolerance of the peritoneum under operations done for the relief of acute irritations, as well as to emphasize the principle I maintain, I beg to present in evidence the following cases, purposely omitting all cases of hernia or intestinal obstruction, referring the reader to Mr. Treeves' recent excellent work on the latter subject.

CASE I. Kuester (Verh. d. Deutsch. Gesellsch. für Chirurg., viii., 1879.)

Rupture of the sac of an incarcerated crural hernia, with escape of fæces into the peritoneal cavity, during a herniotomy. Immediate laparotomy and resection of the gut. Death from septic peritonitis.

CASE II. Schide (Verh. d. Deutsch. Gesellsch. für Chirurg., 1878.) Laparotomy in a case of incarcerated umbilical hernia, with gangrene of the gut. Death four days after operation.

CASE III. Schetelig (Berl. Kl. Wochenschr., xvii., 1880, 657.) Knife wound of the abdominal wall in a decrepit man of sixty. Protrusion and laceration of a part of the colon. Reposition impossible at first. Enlargement of the upper part of the wound with subsequent replacement of the bowel. Recovery.

CASE IV. Wittelshoefer (Wien Med. Wochenschr., xxxi., 1881, 118.) Man brought to Bamberger's clinic with the following history:—Some days before he had introduced a painter's brush into the rectum to stop a diarrhœa, but when he tried to take it out it had disappeared. On admittance presents signs of peritonitis, and examination shows the presence of the body in the sigmoid flexure. Other means proving of no avail, he is transferred three days after to Billroth's clinic for operation. Patient at this time gives symptoms of severe peritonitis and is somewhat collapsed.

Operation by Billroth—laparotomy. Incision beginning at anterior, superior iliac spine and extending as far as the symphyses. Peritoneal cavity is found filled with fæcal matter, indicative of a perforation. Brush found in the ascending colon and removed by an incision 7 ctm. in length.

Toilet of peritoneum, wound of gut sutured, severe collapse after operation. Death.

Autopsy shows perforation of the peritoneal covering of the gut 25 ctm. above the anus.

CASE V. Wittelshoefer (Wien Med. Wochenschr., 1881, xxxi., 117.) Man aged fifty-two, brought to Bamberger's clinic, Nov. 8, with obstinate constipation six days duration. On admittance presents already signs of peritonitis, stercoraceous vomiting, etc. He is found to have a small umbilical hernia, reducible.

Transferred to Billroth's clinic, Nov. 18. At that time already in collapse. The hernia is not as easily reduced and is somewhat painful.

Laparotomy. Incision in linea alba, 18 ctm. in length. On opening the peritoneal cavity, a quantity of fœtid matter oozes out, and there are signs of a general peritonitis. Examination shows gangrene of the gut a little above the ileo-

cæcal junction, and volvulus. Resection. Death in collapse five hours after operation.

CASE VI. Assmuth (St. Petersb. Med. Wochenschr., 1881, 116., et seq.) Incarcerated umbilical hernia in a man aged forty-five. Symptom of acute ileus.

Laparotomy. Omentum and gut found gangrenous and excised. Sutured. Recovery.

CASE VII. Weinlechner (Jahrb. für Kinderh., 1881, xvii., 304.) Laparotomy in child five years old, with intussusception after the development of acute purulent peritonitis. Resection of intussuscepted part. Death five hours after operation from exhaustion.

CASE VIII. Hoffman (Wien Med. Presse, 1881, xxii., 113.) Man aged twenty-four brought to Bamberger with acute gastric symptoms. Diagnosis; perforating gastric ulcer. Transferred to Billroth. Laparotomy performed and shows a perforating ulcer in upper curvature. Edges are excised and united by sutures. Death day after operation. Autopsy shows an enormously distended stomach with thickened walls. What had been taken for an ulcer was probably a spontaneous rupture, the result of the extreme distension.

CASE IX. Hagens (Berlin Kl. Wochen., 1883, xx., 106.) Historical account of one of the oldest cases of gastrotomy, 1635. Operation performed by Schwab on a peasant who had swallowed a knife. Incision two fingers' breadth under the free border of the ribs. Wound in stomach united by sutures, abdominal wound closed. Recovery.

CASE X. Maurer. Perityphlitis in a man aged 17. Incision extending from the quadratus lumborum muscle anteriorly to the anterior iliac spine. Opens into an abscess cavity, communicating with the perforated colon. Recovery.

CASE XI. Weinlechner (Wien Med. Blät., 1882. Ileus in a man aged 52, No. 44.) Laparotomy, incision in median line. Death from peritonitis 18 hours after. Autopsy shows perforation of appendix vermiformis and perityphlitis.

CASE XII. A. Schmidt (Wratsch., 1881, No. 51, 52.—Centralbl. für Chirurg., 1882, 772.) Slow purulent peritonitis in a man aged 21. By aspiration a thin purulent fluid is obtained. Laparotomy. Incision extending from the navel to the symphyses. The whole peritoneal cavity filled with

pus; about 5 lbs. Removed. Drainage, etc. Complete recovery.

CASE XIII. Gussenbauer (Wien Medic. Blät., 51–52.) Sword-swallower, aged 19, during one of his performances breaks the blade in the œsophagus. The lower fragment is pushed into the stomach by the father, as the boy seems to be choking. On admittance an examination is at once made but fails to detect the body either in the œsophagus or stomach. Peritonitis developing, gastrotomy is performed with extraction of the fragment, which is 27 ctm. long. As no perforation can be detected, closure of the gastric and abdominal wound.

Death. Autopsy shows septic peritonitis, wound of the œsophagus 14 ctm. above the cardia, and a perforation at the fundus of the stomach.

CASE XIV. Kocher (Corresp. Bl. Schweiz. Aerzte, No. 23, 24.) Gun-shot wound of the stomach in a boy of 14, quickly followed by peritonitis and collapse; laparotomy 3 hours after. Wound of stomach closed by catgut sutures (Lembert's), closure of abdominal wound. Recovery, patient out of bed seventeen days after.

CASE XV. Sonnenburg (Berl. Kl. Wochensch., 1885, 141–2). Rupture of the bladder in a man aged 36 years, Laparotomy after the establishment of acute symptoms. Abdominal cavity is found filled with urine mixed with fibrino-serous fluid, and signs of peritonitis. The rupture is situated at the inner side of the bladder. It is found impossible either to unite the ruptured part or to sew the bladder to the abdominal wall. Drainage of abdominal cavity. Death eight days after from infiltration of urine and septicæmia.

Mikulicz (Tage Blätt d. Versamml. Deutsch. Naturforsch and Aerzte, Magdeb., 1884, viii., 224). M. performs laparotomy in all cases of injury, whether direct or indirect, to the stomach and intestines, even where peritonitis is already present. He cites the four following cases:

CASE XVI. Laparotomy for rupture of the stomach in a man aged 24. Perforation found at the lesser curvature and is probably the result of extreme dilatation of the stomach. Abdominal cavity is full of fragments of partly digested food. Death three hours after operation.

CASE XVII. Symptoms of obstruction and ileus following a diarrhœa (three weeks duration) in a young man.

Diagnosis, strangulation of the gut. Laparotomy is performed and about one litre of fibrino-serous matter is removed from the abdominal cavity. Volvulus present and reduced. Recovery from operation, but death three weeks after from intercurrent pneumonia.

CASE XVIII. Perityphlitis followed soon after by symptoms of incarceration. Laparotomy, incision in linea alba. Two litres of fœtid purulent matter are removed from the abdominal cavity. Death five days after. Autopsy shows a perforation of the intestine.

CASE XIX. Acute signs of ileus and incarceration in a young man. Laparotomy. One litre of fœtid pus and a number of pieces of undigested potato found in the abdominal cavity. A perforation is also discovered, on the left side, involving the ileum, about six min. long, and four min. broad. No cause can be found for the perforation except that it is a typhoid ulcer in a case of typhoid ambulatorius. Edges of perforation united by sutures. Rapid recovery.

CASE XX. Brugisser (Corresp. Bl. Schweiz. Aerzte). Acute signs of ileus, strangulation, and peritonitis in a man of 74. Laparotomy, incision parallel with Poupart's ligament. Resection of strangulated bowel. Recovery.

CASE XXI. Lloyd (Brit. Med. Journal, March 24, 1883). A domestic aged 19 is admitted to Woman's Hospital late in the evening of Feb. 23. She had been accidentally shot in the abdomen three hours previously. No shock and but little vomiting. Bullet had entered slightly to the left of the median line immediately above pubes. Finger passed readily into peritoneal cavity. Patient becomes steadily worse, and on the 26th has constant vomiting, severe abdominal pain, a temperature of ninety-nine and a thready pulse. Laparotomy in the evening, abdominal section, at once followed by escape of a fœtid, thick, brownish fluid. The intestines are matted together. A coil of gut hooked from the left iliac region has in it a ragged wound about three quarter inch in diameter. Abdominal cavity washed out by plain lukewarm water, a glass drainage tube inserted, and perforated gut is stitched to the center of the abdominal wound. Patient never rallies, and dies in collapse one-half hour after. Autopsy shows that bullet has contused the apex of the bladder, cut through the free edge of a coil of intestine, perforated the mesentery, and lay between it and the meso-colon.

CASES XXII–XXVII. Savage (Br. Med. Journ., April 14, 1882). Reports six laparotomies during *presence of subacute peritonitis with more or less exudation.* All recovered.

CASE XXVIII. Bouilly (Bullet. de la Soc. de Chir., 8 Aout, 1883, p. 690. In a man, who has received two hoof blows in the umbilical region, Bouilly performs laparotomy, twenty-three hours after the injury, as symptoms of perforation and peritonitis are present. On opening the abdominal cavity a rent one and one-half centim. long is found in the small intestine, with irregular margins. Resection of a piece of intestine ten centim. long. Great improvement. Fæces, however, continue to pass through the abdominal wound, (a part of which had been left open). On the tenth day, examination is made of the fæcal fistula, with the object of curving it, but in the evening the patient suddenly collapses and next day dies from purulent peritonitis. Autopsy shows that sutures of intestinal wound had separated, that the separated ends had been shut off by exudation from the peritoneal cavity, and that the rupture of an adhesion was probably the cause of death.

CASE XXIX. Albanese. In a man 76 years of age who four days before admission had received a blow against the abdomen, symptoms of acute ileus and peritonitis became developed. On the seventh day post-trauma laparotomy, the incision being over the colon ascendens. A coil of strangulated intestine is found, bound by adhesions to the cœcum. These are carefully separated, good recovery.

CASE XXX. Willet (St. Bartholomew's Hosp. Reports, 1876, p. 208). T. F., aged 48, admitted with symptoms of ruptured bladder, the result of a kick over the pubes. Laparotomy in twenty-four hours, after development of peritonitis (general). Incision five to six inches long extending from the umbilicus to the pubes. On opening the abdominal cavity, several ounces of brown, urinous fluid escape; a rent is found across the fundus of the bladder three and one-half inches long. Edges of rent are brought together by sutures. Sudden death after a temporary improvement.

CASE XXXI. Heath (Royal Medico-Chirurg. Society, Febr. 25, 1879). Rupture of bladder. Laparotomy. Rent in bladder closed by sutures. Death from peritonitis.

CASE XXXII. Tait (Brit. Med. Journ., 1878, I., p. 677). Laparotomy for abdominal tumor during the presence

of acute peritonitis. The tumor is found to be a Fallopian tube distended with menstrual blood. Drainage, etc., perfect recovery. Tait has done forty ovariotomies during commencing peritonitis. All recovered.

CASE XXXIII. Walter (Med. and Surg. Report., Phila., 1862). Rupture of the bladder in consequence of a kick upon the abdominal wall. As no amelioration follows the introduction of the catheter and as signs of peritonitis supervene, laparotomy is performed. A rent is discovered at the fundus of the bladder two inches in extent. Some extravasated urine in the abdominal cavity. Wound in bladder is not closed, as no urine is seen to escape. Abdominal wound sutured. Recovery. Probably the first case in which laparotomy has been resorted to for acute conditions within the abdomen.

CASE XXXIV. Chaput (Le Progrès Médical, 1883, p. 103). Laparotomy for perforation of the vermiform appendix by a foreign body, during the presence of acute peritonitis. Abdominal cavity filled with fœtid pus. Drainage. Death.

CASE XXXV. Tiling (St. Petersburg Med. Woch., 1884, p. 440). Man aged 19 received while at supper a knife wound four fifths of an inch long, in the epigastric region, one inch to the left of the linea alba and three inches above the umbilicus. While the wound was being sutured, patient vomited large quantities of a reddish chyme and later pure blood. Laparotomy. Incision six inches long in median line. On section of peritoneum much blood escapes. The finger introduced detects a wound in the left gastro colic ligament leading to another in the posterior wall of the stomach through which the mucous membrane protrudes. The edges of the stomach wound are brought together by sutures; owing to the collapsed condition of the patient the abdominal cavity cannot be thoroughly cleaned. Abdominal wound closed by Lembert's sutures. Quick recovery.

CASE XXXVI. Taylor (Lancet, 1884, ii., 589). Girl, aged 15, gives symptoms of acute hydronephorosis. As the symptoms increase in severity, laparotomy is determined on. On the morning of the operation, symptoms of collapse set in, the cystic tumor which was before perceptible on the left side had also disappeared, and the abdomen is very tender. As rupture of the cyst is probable, immediate laparotomy. Incision in median line. Peritoneal cavity filled with urine. As the point of rupture cannot be found the cyst is

opened at another place, and the edges of the wound stitched to the abdominal wound. Recovery with a urinary fistula.

CASE XXXVII. Frederick Treves, F.R.C.S., (in a paper read before the Royal Med. and Surg. Society of London, on the "Treatment of Peritonitis by Abdominal Section,") reports a case in which a large pelvic abscess had burst into the peritoneal cavity followed by acute peritonitis. Laparotomy under strict antiseptic precautions. Peritoneum showed appearances of acute peritonitis. The whole cavity washed out, and drainage introduced. Patient made good recovery.

CASE XXXVIII. Mr. Howard Marsh at same meeting read the history of a case, the patient being a medical student who was attacked with symptoms of sudden and acute peritonitis. Laparotomy. About two pints of fœtid pus evacuated. Whole cavity washed with solution of carbolic acid 1–60, and drainage introduced. Recovery.

In the discussion which followed the reading of Treves' paper, Bryant, Thornton, Powell, Barwell, Goodheart, and Meredith, were in perfect accord in commending the practice carried out in the two cases noted.

CASE XXXIX. Omental Abscess, rupture into peritoneal cavity. Laparotomy. Recovery. T. H. Burchard.

On Aug. 20th, 1883, I was requested by Dr. Frederick D. Lente to see Ephraim Wells, aged 25, a colored waiter, employed in one of the smaller hotels in Saratoga. For some three weeks Wells had been confined to bed, suffering from a severe cellulitis of the abdominal walls. Several superficial abscesses had formed, which had been opened by Dr. Lente.

He had suffered intense abdominal pain, temperature fluctuating from 101⅜° to 104½° and was rapidly emaciating. For six or seven days prior to the present complication, his abdomen had become tympanitic and the pain more diffused. For forty-eight hours there had been excessive hiccough and frequent retching of green mucus. On night of Aug. 19th he took surreptitiously four compound cathartic pills. At seven o'clock on the morning of the 20th, Dr. Lente was summoned and an hour later I saw him.

He was lying semi-moribund, with legs flexed. Abdomen moderately distended and breathing thirty-two times a minute; his pulse was 120 and his temperature 102⅛.

Examination showed an indurated condition of the tissues of the hypogastric and left hypochrondriac regions, the integument being somewhat erysipelatous in appearance. The indurated mass appeared to involve the entire thickness of the abdominal wall, and was about six by seven inches in diameter. Both Dr. Lente and myself thought we detected deep-seated fluctuation, and although a Luer's aspirating needle failed to give pus, at Dr. Lente's request I proceeded to evacuate the abscess.

Dr. Wm. Curtis of Philadelphia gave ether. The incision was made in the median line (deep-seated fluctuation appearing more distinct there, although the principal part of the induration was slightly to the left,) and extended from an inch below the ensiform cartilage downward to the umbilicus.

Just as I reached the linea alba, at a depth of fully two and one-half inches, something was felt to suddenly give way beneath the hand, as though an abscess had burst within the peritoneal cavity. Although it was thought the patient would certainly die, it was determined that what little chance he had depended upon giving vent to the pus anteriorly. The incision was extended through the linea alba and into the great omentum, which was adherent to the abdominal wall and the seat of the abscess.

Omentum, intestines, and mesentery, were matted together in one inseparable mass, and pus of an extremely fœtid odor welled from the cavity of the belly. I should say fully a quart and a pint escaped.

The patient grew rapidly weaker. Inhalations of ammonia and amyl and hypodermics of whiskey were freely used. Warm milk punch was injected *per rectum.*

The patient rallying, the incision was prolonged below the umbilicus; so as to get beneath the abscess and so thoroughly wash out the abdominal cavity.

Fully a gallon of warm carbolized water (three per cent) was thrown gently in among the matted coils of the intestine. The walls of the abscess cavity were sparingly dusted with iodoform, and two rubber drainage tubes were inserted. The upper and lower ends of incision were sutured with silver wire, the median portion above the umbilicus being purposely left open to permit of free drainage.

A pad of oakum, wrung out in Sol. Hydrarg. Bichlor. 1–1.000 was placed over entire wound and a light bandage applied.

The patient rallied poorly from operation. Hiccough and

vomiting continued entire afternoon. Pulse most of the time being scarcely perceptible. 2 P.M. P. 140, T. 103⅞, R. 26. 5 P.M. P. 136, T. 104⅜, R. 30.

Cracked ice and small potions of Champagne frappé were given by the mouth, and enemæs of beef peptinoids and milk punch were given each four hours. Morphine, atropia and digitalis, were given hypodermically—p.r.n. Ice coil on abdomen.

Aug. 22, 5 A.M. P. 130, R. 28, T. 100⅜, sleeping quietly. Has had during past twenty hours Morphine 2⅛ grains, Atropia gr. ¼, Tinct. Digitalis ♏ XL. 4 P.M. P. 124, R. 27, T. 101⅜. Wound discharging freely. No hiccough or vomiting.

23rd, 8.30 A.M. P. 118, R. 24, T. 100⅛, comfortable night. 3.30 P.M. P. 116, R. 26, T. 100⅜. Morphine 1¼ grains in twenty-four hours. Peptonized milk and iced champagne taken.

24th. Vomited once during night. General condition excellent. Wound discharging comparatively little. 9.45 A.M. P. 115, R. 22, T. 99⅜.

26th. Improving in every respect. Abdominal induration disappearing. Removed one drainage tube and one stitch. Ordered tonic: iron, quinine and strychnia.

29th. Removed all stitches. Incision about one-half inch long. Removed rubber tube and inserted one of decalcified bone.

Sept. 2nd. Patient convalescing rapidly. I leaving Saratoga to-day, Dr. Lente took entire charge of the case. A few days after Dr. Lente returned to Cold Spring, and I never saw him again alive. I learned, however, that Wells left Saratoga about the last of September in excellent condition. Most diligent inquiry has failed in finding his whereabouts since.

Now, if these 39 cases with 23 recoveries teach anything, they teach not merely the feasibility of such operations, but more than that, they give us legitimate ground for encouragement in fully sixty per cent of these otherwise hopeless cases.

In contrast with the above, permit me to give very briefly the history of my sixth case of perforation of the Appendix Vermiformis, purposely omitting names and dates.

I was requested by Dr. —— to see Miss —— in consultation. She was 22 years of age and generally had enjoyed

good health. Three months before had had an attack of perityphlitis, which had lasted about three weeks. A small mass of induration, about the size of a billiard ball, was still left. She had had another attack sixteen months before.

On the evening prior to the present attack, had been to a party, danced excessively, been overheated, drank considerably of cooling beverages, and in going home and after she retired had chilly sensations. On awakening about 8 A.M., feeling "uncomfortable in her old spot," she took a large saline.

This was followed by two copious movements; during the second she experienced a sudden sharp, darting pain in her right side and immediately fainted. I saw her about noon. She was then in excellent condition, P. 108, Temp. 100. Abdomen moderately distended, some hiccough and nausea. Pressure over tumor produced sharp pains. Stethoscopic examination over cæcum gave distinct fremitus and crepitation. I diagnosed unhesitatingly perforation of the bowels, and urged an immediate operation. My advice was not accepted. At 9 A.M. following morning I was summoned hastily and to "be prepared to operate." The condition of things had now entirely changed. The patient was semi-moribund, abdomen enormously tympanitic, pulse 140 and intermittent. Naturally, an operation at this period would have been worse than useless. The patient died two hours later, or twenty-seven hours from the commencement of the attack. It was with melancholy interest that I saw the autopsy reveal a minute perforation at the base of the appendix, not three lines in diameter. The appendix was bound down by old adhesions. There was the faintest exudation of lymph immediately around the perforation.

Austin Flint, in his last edition, in speaking of septic peritonitis (Flint's Practice, page 590), says, "The time may come, when paracentesis abdominalis will have been proved to be as applicable to certain cases of peritonitis, as are thoracentesis injections into the pleural cavity, and a permanent opening in the chest, in cases of suppurative pleurisy." In

the light of the above cases, I submit, has that time not already come?

Regarding the medical treatment of peritonitis, there are some points of special interest worth considering; and, first, as to the opium treatment.

Opium is our sheet-anchor in the treatment of peritonitis; and yet, indispensable as the drug is, there are certain conditions which arise in the course of the disease, in which the drug can only be used with the greatest caution. The indiscriminate use of opium, even in peritonitis, is quite capable of doing more harm than good.

The symptoms of peritonitis vary with its extent, severity, and the causes which produce it. When the disease develops gradually, as from a pre-existing visceral inflammation, for some time there may be little or no constitutional disturbance. When it develops suddenly, however, and particularly if from internal traumatism, as hernia, perforation, or other intestinal injury, the condition of shock enters as a very important element in the development of symptoms, and the treatment must be varied accordingly.

This initial collapse of peritonitis is a subject upon which too little has been said, and yet its treatment is of most signal importance. I have seen it persist for hours after well-pronounced peritonitis had developed, as evidenced by increasing meteorism, increasing abdominal tenderness, and a rising temperature, and yet, the while, the patient lying listless or semi-conscious, with limbs extended, with features pinched and shrunken, and a pulse scarcely perceptible.

A most remarkable case of this kind occurred in my practice a few years since. A young gentleman, John H., aged about 26 or 27, came to my office one morning complaining of a left epididymitis. As the inflammation was of unusual severity, I sent my assistant, Dr. L. D. Woodbridge, to his home to apply half a dozen leeches over the cord in the left inguinal region. About midnight I was summoned to see him, as he was suffering severely.

Dr. Woodbridge responded to the call and found his pain was less, but that he was rapidly sinking into a condition of

collapse. At 2 A.M. Dr. Woodbridge wrote that "Mr. H. was evidently dying." I went at once and found my patient unconscious and almost pulseless. His respirations were very shallow and at times would stop altogether. His pupils were widely dilated and irresponsive. Superficies of the body pale and cold. Rectal temperature 96°. Abdomen greatly distended, and pressure on it would cause a reflex regurgitant movement in throat, and an expression of pain. During the early afternoon this temperature rose to 102⅘ and he became deeply cyanotic.

Dr. Loomis saw him at 2 P.M., confirmed the diagnosis of peritonitis, and said the patient, being then comparatively pulseless, would certainly die. At 5 P.M., after fifteen hours' constant labor, keeping up artificial respiration all the while, and feeling that he could survive but a very few minutes, Dr. Woodbridge and I left the house.

At 6.30 P.M. we were recalled to find him slowly regaining consciousness. He subsequently fully rallied, passed through an unusually severe peritonitis, and is now well.

In speaking of treatment, the text-books generally recommend that "as soon as the unmistakable symptoms of peritonitis are developed, administer at one dose from two to five grains of opium, or from one half to one grain of morphine."

And yet physiological experimentation has proven that collapse, such as existed in the above case, is dependent upon vaso-motor paresis, and the deeper the involvement of the sympathetic, the more profound the collapse.

Now, this is a condition of the system in which opium, even in moderate doses, is poorly borne. Infinitesimal doses of morphine in conjunction with atropia, by mitigating pain and securing nervous tranquility, undoubtedly exert a favorable tonic influence upon the heart. Large doses increase the paralysis of the cardiac inhibitory centre, and still further cripple that organ.

This is no visionary condition of affairs, for I have more than once seen a heart feebly endeavoring to rally from the shock of a commencing peritonitis well nigh overwhelmed

by a dose of morphine that the text-books would justify, and one which a few hours later would be insignificant.

Another and very important fact to be noticed in the commencement of peritonitis, and governing greatly the freedom with which opium may be used, is the perplexing discrepancy that ofttimes exists between the severity of the pain and the apparent hard-time-wiry pulse on the one hand, and the very great heart feebleness on the other.

Under such circumstances, every dose of opium given, unless guarded by atropia or digitalis, jeopardises the heart, and no dose should be administered under such circumstances without previous careful cardiac auscultation.

There is another condition developing later in the history of the disease, in which the administration of morphia in large doses is equally prejudicial, and upon which condition current literature is likewise unfortunately silent.

I refer to the hypostatic pneumonia, which, owing partly to the patient's asthenic condition, and partly to pressure on the lungs from excessive tympanites, is so apt to develop at that time.

Here, too, we have an important inhibitory centre, the respiratory, paralyzed from carbonic acid gas poisoning. In addition, we have lungs badly compressed, with blood imperfectly aërated sluggishly flowing through them; portions of the pulmonary structure are consolidated, either from simple stagnation of the blood or from lobular inflammation.

At this stage a slight over-dose of morphine might arrest entirely the respiratory act. Yet I have seen its use persisted in under these very conditions.

When the disease has reached this point, and cyanosis begins to develop, I believe little is gained from pressing opium, and it is wise to suspend its administration except at infrequent intervals, giving it only to meet some special indication, and guarding it carefully with digitalis, atropia, or ammonia. At this period stimulating hypodermics should be freely resorted to; dry cups to the lungs are of signal benefit, and inhalations of oxygen often tide us over an ugly complication.

In a case of peritonitis under my charge last winter, a young lady of 20, in third week of typhoid, my assistant, Dr. Henry A. Mandeville, and myself fought day and night for nearly a week a temperature that fluctuated from 103 to 106⅘, until at last she went into unconsciousness from respiratory failure and carbonic acid poisoning. Although the cyanosis involved the entire body, and she had been practically pulseless and unconscious for eighteen hours, nevertheless under the atropia and other stimulants that were injected, and the oxygen inhalations that were given, she rallied and regained consciousness.

Regarding the use of opium, freedom from pain is the ideal condition to be secured, irrespective of the quantity of the drug administered. When this is attained, sleep, from which a patient can be readily aroused, follows as a natural consequence. Opium, or its alkaloid morphine, should be administered. Personally, I prefer the hypodermic administration of morphine, not alone from the simplicity and certainty of its administration, but, what is of more consequence, the absolute knowledge it gives us of the exact quantity of the drug our patient is receiving. Given by the mouth, how much is absorbed, and how much lies dormant in the stomach, is purely a matter of conjecture.

Several years since, a patient of mine convalescing from peritonitis, passed a curious mass at stool several days after the discontinuance of the drug. Upon examination, this proved to be a collection of opium pills that had been prepared at one of the most reliable pharmacies in the city.

I am confident that had this amount of opium been absorbed, it would have killed my patient, in which event the cause of death would naturally have been attributed to the peritonitis.

Objections have been raised against the combination of atropia with morphia, it being alleged that the physiological antagonism that naturally exists between these two drugs, tends to render the development of symptoms irregular and their interpretation more perplexing and obscure.

Undoubtedly, atropia does produce a marked change in

the patient's appearance, and certain very characteristic changes in the phenomena of the disease, but these changes we believe are in every way favorable to the patient.

There is no one drug in the treatment of collapse, whatever be its cause, whether traumatic or from disease, in which more implicit confidence can be placed than in atropia.

Owing to its stimulating action on the inhibitory centres, the heart gains strength, the respiratory act deepens, and the phenomena of shock yield in a surprising manner to those of reaction. In the later stages of peritonitis, especially when the heart and lungs fail, and when gastric regurgitations and hiccough are rapidly exhausting our patient's vitality, I have obtained results that were simply marvelous from the administration of one or more hypodermics of atropia, varying in strength from $\frac{1}{60}$ to $\frac{1}{10}$ grains each, and given either alone or in combination with morphia, digitaline, ammonia, or alcohol, according to the special indications existing.

The contrast in the appearance of two patients, one being treated with atropia in combination with morphine, and the other with morphine alone, is most marked; while in moments of special exigency the value of this drug is inestimable.

The amount of morphia that should be administered varies naturally with the patient's susceptibility, the severity of the disease, and the amount of pain.

Each patient in these particulars is a law to himself, and no rule could be formulated that, in a general way even, would apply to individual cases. The remarkable tolerance of morphine in peritonitis is too well known to require more than a passing mention.

And yet, since adopting the hypodermic method, I have been surprised to see how little was generally required, as compared to the immense doses formerly given by the mouth.

After being brought to a condition of partial narcosis, there have been comparatively few cases, except those of a

septic nature, that have required more than two grains of morphine a day.

Although in the case attended by Dr. Loomis and myself, after giving three doses of two grains each hypodermically, an hour apart, I gave one grain, hypodermically, each hour for twenty-seven consecutive hours, without entirely controlling the pain, or materially reducing the frequency of the respirations, which varied from 25 to 30 a minute. The case recovered, the patient receiving during the first five days of his sickness sixty-three grains of morphine, hypodermically.

EXTERNAL APPLICATIONS.

Much has been said of the efficacy of external applications, used either hot or cold.

Poultices are still used by many. Until within the last two years, I employed them exclusively. Upon what therapeutic principle their use was based, I didn't know then; I don't know now. Under these conditions only can I conceive any physiological reason for their employment: first, in the commencement of a peritonitis, by their sedative effect upon peripheral nerves, they may assist in lulling pain; secondly, during the passage of urinary or biliary calculi, or in intestinal colic, they may assist in relaxing spasm; and lastly, during the stage of decline they may hasten the absorption of inflammatory products. For these reasons poultices are indicated; otherwise they neither control inflammation, reduce temperature, or lessen tympanites. All of which is done, and with perfect comfort to the patient, (provided the temperature of the water is reduced gradually), by the employment of the ice-coil.

If experimental physiology has taught us anything, it is that cold applied to peripheral sensory nerves controls the afflex of blood to those parts supplied by the vaso-motor nerves that inosculate with such sensory branch.

The sympathetics distributed to the intestines and peritoneum arise from the solar plexus, the sensory filaments being the lumbar nerves which supply the wall of the abdo-

men. Ice applied to the abdomen constricts the blood-vessels of the intestines and peritoneum, and it is in the reflex contraction of these blood-vessels that the benefit resulting from the application of cold to the abdomen finds its physiological explanation. Poultices are not curative. Cold judiciously employed lowers temperature, reduces inflammation, relieves tympanites, and secures nervous tranquility. There is but one way of employing cold, and that is by the ice-coil. This can be readily extemporized from either lead or rubber tubing.

For diet nothing is comparable with peptonized milk, to which additional cream may be added if desired. Valentine's beef juice, beef peptonoids, and Leube's meat solution, furnish valuable nitrogenized preparations.

For the relief of tympanites, much depends upon whether the gas is within the cavity of the peritoneum or in the intestines. If the former, a fine aspirating needle may be introduced and with immediate relief. If the latter, a long tube may be passed up the bowel and an ounce or more of some warm aromatic solution injected. Gas must not be expected to escape through a tube occluded with fæces.

Large fæcal masses not infrequently prevent the escape of flatus by blocking up the rectum. Under such circumstances, a large enema of flaxseed tea, in which some ox-gall has been dissolved, may be injected with benefit. A patient of mine, who was once rapidly succumbing to increasing tympanites, was saved by this simple procedure.

Pneumatic aspiration of the intestine, I regard as neither surgical nor safe.

As in the case Prof. Polk reported at the Obstetrical Society, I have seen gangrenous inflammation with fæcal extravasation follow the puncture.

Turpentine stupes I resort to, more out of respect to a tradition, than because of any very positive benefit I have ever seen follow their use in general peritonitis.

When turpentine is pushed to any considerable extent, I fear damage to the kidneys.

I have seen both strangury and hæmaturia follow its ex-

ternal application. In two cases I have noticed a marked increase of albumen in the urine following its employment. A discontinuance of the stupes caused a total disappearance of the albumen in one case and a considerable reduction in the other.

Independent of the fact that Bright's disease is, of itself, a frequent cause of peritonitis, (Habershone's statistics give 63 cases of Bright's as the exciting cause of 301 cases of peritonitis. Med. Times and Gaz., Dec. 13, 1859.) The anatomical position of the kidneys renders them prone to take on inflammation whenever that structure is inflamed. Hence I have often questioned if a powerful irritant to the kidneys, as turpentine is, does not sometimes add additional irritation to these organs.

Daily and frequent urinary examinations should be made; for more than once have the timely application of cups and a digitalis poultice over the kidneys, saved for me the life of a patient who was individually developing a nephritis, which without such examinations would never have been suspected.

Last, but by no means least, the successful treatment of peritonitis demands a personal devotion and attention involving complete abnegation of self.

The following case reported by the New York Medical Record Nov. 12th, 1875, is added as illustrating the principles embodied in the above paper.

CASE XL. Intestinal Obstruction—Acute Peritonitis—Laparotomy with Removal of Ovarian Tumor—Recovery. By J. W. Lilly, M.D., Pomeroy, Ohio.

Mrs. B., married, 35 years of age. Mother of five children. Patient had been suffering for ten days with obscure symptoms, pointing to some slight inflammatory trouble with the bowels, for which the ordinary remedies were prescribed. The bowels were constipated, the abdomen was enlarged, tympanitic, and painful. Below the umbilicus there were dullness on percussion and sensitiveness to pressure.

On the eleventh day, the patient was suddenly taken with severe vomiting.

The diagnosis of peritonitis, with some form of abdomi-

nal tumor, was made. From this time the patient grew worse; the vomiting grew more and more frequent and finally stercoraceous in character.

On Aug. 25th, (about the fifteenth or sixteenth day,) the patient was anesthetized and an exploratory incision was made between the umbilicus and the pubis.

The intestines were found congested and much distended with gas; there was general peritonitis. A new growth was discovered extending from the pubis to the umbilicus, which was found to be an Ovarian Tumor, bound down by adhesions, one of which had caused the obstruction to the bowels.

These were torn through with considerable difficulty and tumor removed.

The patient made a good recovery.

PHYSICAL EXAMINATION OF WEAK CHESTS AND DIFFERENTIAL DIAGNOSIS OF THE SEVERAL FORMS OF EARLY PHTHISIS.*

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OUR system of physical examination of the chest, as developed by Avenbrugger, Laennec and Piorry, has received numerous amendations and additions from a host of investigators and teachers in Europe and America. The more prominent of these abroad are Skoda, Allison, Gairdner and Walshe; and not less valuable and original are the contributions in our own country, of Flint, Loomis, Leaming, Camman and Clark.

The profession has come to regard physical diagnosis, in the hands of experts, as affording exact knowledge of the conditions of the intra-thoracic organs. It is accepted, as a fact fully established,that,by the application of acoustic laws, certain combinations of physical signs lead to an immediate and correct diagnosis in most cases of pulmonary disease.

But the interpretation of physical signs can never be dissociated from some theory of the nature of the existing disease, a conception of its pathogenesis, and a knowledge of its gross and minute pathology, as well as of the pathological processes which determine its consecutive steps or stages, and its periods of transition from one to another form.

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* Read before the New York Academy of Medicine, May 7, 1885.

The conclusions of Piorry in percussion and of Laennec in auscultation were interpreted therefore, so far as regards pulmonary phthisis, upon the basis of the pathology of Bayle and Louis, the unity of pulmonary phthisis, and the tubercular nature, *ab initio*, of each and every case.

This view of the specific nature of all phthisis and its transmission solely by heredity had not been questioned for nearly fifty years.

But the last twenty years have witnessed almost a revolution of opinion as to the prominence, or causative relation, of miliary tubercle in phthisis. It may at least be affirmed, that, while division of opinion still exists on this question, a majority of all investigators and of the profession have come to acknowledge the three forms of phthisis—the catarrhal, fibroid, and tubercular—as so clearly presented by Sir Andrew Clark abroad and Prof. Loomis in our country.

But there is also reason to believe not only that pulmonary phthisis presents these three distinct types, the catarrhal or bronchial, the fibroid or interstitial, the tubercular or constitutional, but also that, in very many cases, it exists in a mixed form. A vertical section of many phthisical lungs, presents, in irregular distribution, areas of bronchial catarrh, thickened bronchus, peri-bronchial infiltration, bronchiectasis, interstitial fibroid infiltration, caseation, softening, antrum, and inflammatory changes in the investing pleura, not infrequently extending to the parietal pleura, with intervening intra-pleural adhesions. It is not desirable to be diverted from the subject of our consideration, the physical diagnosis, to consider the many unsettled points as to the relative influence of bronchial, interstitial and pleuretic inflammations in developing this mixed pathological result.

But I am satisfied that, in consideration of the different methods of origin and the complex nature of a large proportion of cases of phthisis, our physical exploration is incomplete if we discover only the presence of cavities and softening, or the evidences of local consolidation. A complete diagnosis should include, *in extenso*, an exact knowledge of the condition of each portion of the respiratory apparatus,

including the air passages, vesicles, interstitial tissue and pleura.

Under these circumstances, it is evident that the chapter on Physical Examination of the Chest, if by any regarded as closed, must be reopened to admit new facts and new interpretations of the old acoustic laws, in the light of a broader and changing pathological view.

The views which I present relate to the methods of examination most useful in studying weak chests with tendencies to phthisis, in detecting the times of transition from danger to disease, and in differentiating the early forms of phthisis. They include no new theory as to the disease, nor are they the product of speculation, but represent the opinions and convictions which I have reached, first as a faithful student and observer of our several authorities on the subject, and concurrently, by independent observation in private practice during the past eighteen years, and my clinics during the past twelve years, either at the Woman's Medical College, or at the New York Polyclinic and my wards in Bellevue Hospital.

I recognize with Simon of London, that struma or the lymphatic temperament supplies a ready soil for phthisis; with Niemeyer, Rindfleisch and the Germans of the past twenty years, that the lymphatic capillary tissue of the lungs is essentially the channel of infection for tubercular cases, whether by vitiated air and food, by toxic substances, or absorption of the liquified cheesy products of inflammation. But observation has also made me a firm believer in the agency of inflammation as the chief factor in developing pulmonary phthisis, whether in those predisposed by heredity, or in those free from such predisposition; the latter class, I believe, to include the great majority of cases. That inflammation, in intercurrent attacks, is the most prominent feature of the progress of phthisis from stage to stage is quite generally recognized.

In our conception of phthisis, it will be of advantage to defer the study of the disease in its mixed and complex forms, until the essential evidences of the three definite

types are reviewed. Virchow has exerted a powerful influence in favor of keeping close to anatomical and physiological purposes of parts in the study of their morbid changes, calling attention to the fact that in most organs disease is primarily either of its functional structure, or of its interstitial vascularized parenchyma, or of its cortex and investing capsule. It is so with the meninges of the brain and cord, the nerve substance and connective tissue. So also in the liver, and in the kidneys. Glomerula nephritis, tubular nephritis and interstitial nephritis, start independently, but ultimately become more or less associated in the same organ.

In the thorax, with reference to the respiratory organs, this is especially true. The larger bronchi have a set of afferent and efferent nutritive vessels essentially separate from those of the infundibuli and air sacs, and the latter, while receiving in a limited degree the blood of intervening bronchial arterioles, yet possess a circulation of their own, and the circulation of the parietal pleura is wholly independent of either. We are prepared, therefore, in advance of actual search, to find diseases distinctly originated in these differently vascularized tissues and regions.

An epitomized statement of the essential physical signs of early phthisis, as generally held, may be included under two heads:

1st. That the existence of an area of dullness on percussion, of absent or enfeebled vesicular murmur, with increased conduction and raised patch of respiratory, voice and tussal sounds, indicates parenchymatous infiltration, whether of tubercular or inflammatory origin—the air sacs are either collapsed or engorged with catarrhal products—in fact a consolidation existing, which tends ultimately to caseation, softening and cavity. Local subcrepitus in such an area is regarded as evidence of collateral hyperæmia, or, of the existence of a local catarrhal process, tending to further interstitial deposit and further occlusion of air vesicles. The history of the patient influences the diagnosis as to the tubercular or catarrhal nature of the case.

2d. That an area of notable dullness or flatness on percussion, and of deficient conduction of sounds points to fibroid phthisis. This deficiency of sounds may range in degrees from enfeebled sounds, though masked, distant, indefinite sounds, to silence, or, with the deficiency of conduction of the breath, voice and cough characterizing fibroid, may also be associated other diagnostic adventitious sounds, as of emphysema, bronchial constriction or bronchial cavity.

In addition to the above-recognized distinction, I believe that many careful students of chest acoustics have come to a recognition of the differentiation of the forms of fibroid consolidation, whether starting from the bronchi, or centric and diffuse, or again distinctly of pleural origin. Thus,

(*a.*) When over a definite area the percussion note is pronouncedly flat or high pitched, with relatively but a slight conduction of the normal sounds, unchanged in pitch and quality, and when the sounds, though discernable, are feeble and distant, the fibroid is likely to be peripheral, starting from the pleura, the product of an imperfectly resolved pleuro-pneumonia, or of a local plastic pleurisy leading to underlying hyperæmia and subsequent hyperplastic fibroid.

(*b.*) When the union of flatness on percussion and obscuration of respiratory and voice sounds is pronounced, especially if bilateral and attended with great reduction of respiratory motion on both sides, the fibroid is likely to be more generally and diffusely interstitial. Such is the condition found in advanced cases for the gouty diathesis, in brown induration or interstitial results of long-standing cardiac incompetency, and in syphilitic phthisis. The same conditions existing in but one lung cannot be inferred with equal certainty.

(*c.*) When the percussion note, relatively, is but slightly raised in pitch, being rather deficient in duration, and devoid of pulmonary quality, and there co-exists a general enfeeblement of respiration, or a general absence of volume in respiration, the fibroid is likely to have started from the bronchi. The presence of an exaggerated tubular quality of inspiratory sound, with slight increase of pitch; of re-

tarded tubular expiration, with or without rules, will further determine whether the case is more specially one of peri-bronchitis, or bronchial thickening, or bronchial rigidity and dilatation.

The first point which I desire to discuss, with reference to efficient and correct chest exploration, is the importance of examining all parts of the chest. Too often the front of the chest is cursorily examined, with reference chiefly to the condition of the apices. The chest should be divested of clothing, or, in the case of ladies, covered only with a thin merino shirt or dressing sacque, which may be raised in parts as required for inspection of the chest wall. The chest should be examined from apex to base of lungs—front, side, and back. Two areas, almost wholly passed over by most examiners, often afford most valuable information. They are: first, the high axillary region, and second the interscapular spaces.

The examination in the axillary line high up, with the arm carried over the head, should be made in all cases. It must have come to the notice of very many physicians in private practice, but more often in the grouped cases of general hospitals, that in cases of irregular pleuro-pneumonia, and in low and indefinite forms of pneumonia—the product of squalor, dissipation, malaria or secondary to phthisis—the initial area of pneumonic consolidation, as evidenced by bronchial breathing, has been found only in the axilla.

The importance of the interscapular exploration is such as to warrant a fuller consideration. It is here that we have the larger bronchial trunks and the hilus of each lung close to the posterior wall of the thorax. But in the ordinary postures, with the head erect and arms hanging by the side, or even with the arms loosely folded in front, the interscapular spaces are relatively valueless for physical diagnosis. The scapula, on either side, covers the chest from the first to the eighth rib, and comes within an inch of the processes of the vertebræ. This intervening space on each side of the spine is filled in deeply by the rhomboideous minor and major, which span it obliquely from the vertebræ to the

scapula, and to complete the muscular envelopment the trapezius extends from its median origins at the occiput, the ligamentum nuchae the cervical and twelve dorsal vertebræ, in converging bands, over the interscapular space and scapular blade, to its attachment on the spine of the scapula. The value of the upper half of the back for percussion is therefore slight, over these thick flaccid muscles and this interposed bony plate. Most physicians recognize this condition and obviate it, in a measure, by directing the patient to fold the arms. By a forward motion of the arms, the claviculo-scapular union, being essentially fixed, serves as a point of rotation, while the tension of the deltoid on the spine of the scapula directly antagonizes the trapezius and draws the scapula literally with slight rotation. Dr. Corson, more than any other person, has emphasized the importance of taking advantage of the great mobility of the scapulæ as a means of increasing the interscapular area.

If the arms be crossed in front, each upward, at an angle of 45 degrees, and the hand on either side is made to grasp the convexity of the shoulder, the clavicular attachments and the deltoid so elevate, rotate, and draw outward the scapulæ, that the interscapular space is increased more than two fold, and the previously flaccid and thick muscles are rendered tense and thin, lying firmly on the ribs, and interposing no obstacle to percussion and auscultation of the bronchi, and of the upper inner borders of the lungs. Each intra-scapular area, before a rectangle of one inch width, extending from the first to the eighth rib, is converted into a trapezoid whose upper truncated apex is fully two inches wide and whose base is between three and four inches broad. The lower angle of the scapula is elevated to the seventh rib. This great gain in space, however, is not more important than is the advantage from the thinning out of the trapezius and rhomboidei. Finally, if the patient's head be bowed, and the neck forcibly incurvated forward, the tension of the levator anguli scapulæ is added; it increases the elevation of the scapulæ by half an inch, and adds to the general tension of the dorsal muscles. The scapulæ have

not only been moved laterally, but the thin plates, as located, are firmly held between tense muscles, and interpose a greatly diminished obstruction to conduction of sounds. I would urge the resort to this position as greatly facilitating the study of chronic bronchitis, peri-bronchial fibroid, and indeed, of all forms of bronchial and pulmonary diseases.

In treatises on the systematic exploration of the chest, "inspection" is, by all authors, placed first; but a variable and limited value is ascribed to it. I am, however, convinced that in a large proportion of chest cases, and in a large number of phthisical ones, an approximate diagnosis can be made by inspection alone.

The second consideration of this paper, therefore, is the diagnostic importance of inspection, and the desirability of extending it, in detail, to all the structures of the thoracic wall. It is customary with all to observe certain general features by inspection, as the breadth of the shoulders, the equal or unequal volume, and the symmetry or asymmetry of the two sides, the relative height of the shoulders, the comparative fullness of respiratory expansion, areas of bulging or retraction, and the relative prominence of the sternum and costo-cartilaginous unions. But three other points, in inspection, of much value, may be briefly discussed.

The first is the direction of the clavicle. Broad shoulders and a nearly horizontal inner half of the clavicle give promise of fully developed lungs. The clavicle in some persons is horizontal in its inner half, though more often it is deflected upward from 5 to 10 degrees, when it curves, going more obliquely upward and backward in its second half, to its scapular attachment. The upward angle of the line of the clavicle as a whole, is, therefore, in healthy chests, within the range of 10 to 15 or 20 degrees. But when the clavicle is deflected upward and backward, at an angle of 30, 35 or 45 degrees, the chest development has manifestly been most defective during a long term of years, and the presumption is in favor of the existence of lungs, undeveloped at their apices, which have never fully occupied the supraclavicular and clavicular areas.

The second point is with reference to the relation which slight lateral curvatures of the spine bear to the condition of the respiratory organs.

An inquiry into the history of a considerable number of cases of lateral curvature will elicit the fact, that its appearance has been subsequent to the occurrence of a pronounced attack of pleuritis or pleuro-pneumonia, or a period of long-continued unilateral thoracic pain with associated cough. It is further found in many of these cases, that the deflection is toward the side of the chest possessing most respiratory expansion, and that the concavity of the primary curve, and the convexities of the compensatory curves are toward the side presenting slight or notable diminution of respiratory motion. And further exploration, by means of percussion and auscultation, establishes the fact that the curved section of the spine lies within a zone of the chest, affording evidences of thickened pleura, fibroid phthisis or peribronchial consolidation. Where this combination of conditions exists, it is reasonable to conclude that the inthrathoracic changes, of one side, have diminished the respiratory action of the overlying muscles, and that an unequal traction of the spine, by the antagonizing muscles of the two sides on the back, has resulted in the curvature to the side of greater respiratory action and of stronger muscles. I do not mean to imply that any proportion of lateral spinal curvatures are a sequence of pulmonary disease, but to emphasize the fact that this is the case sufficiently often to warrant inspection of the spine in all cases.

Barwell has called attention to this fact in so far as it relates to the etiology of the spinal disease. Reversely it may be noted that pronounced lateral and even angular curvature, originated through dyscrasia or malnutrition, and of long duration, does not materially cripple the contained lungs. From the examination of a considerable number of chests, seriously distorted by spinal disease, I have been surprised to find how generally the lungs and heart have adapted themselves to their changed accommodations. They are often exceptionally healthy, and when otherwise, instead of

inflammatory changes, or phthisical deposits, we find emphysema alone has been developed as the result of the chest asymmetry.

The third and final consideration which I present, under inspection, as pertaining to early phthisis, is the importance of closely observing and interpreting, with their full significance, the changes in the individual intercostal spaces and also in the supraclavicular space, suprasternal notch, and epigastrium.

A pronounced depression above and below the clavicle, associated with narrow shoulders and marked deviation of the clavicles upward and backward, may exist over feebly developed apices, which, however, are not diseased. But such depression, in a person possessing ordinary breadth of the shoulders, and whose clavicles are but slightly deflected upward, is indicative of consolidation of the apex, whether by tuberculatization or inflammatory infiltration. In both cases little respiratory movement will be observed, but percussion and auscultation at once determines which of these two states exists. The sinking in of the infraclavicular space, or of special intercostal spaces, synchronous with the inspirations, and notably in chests which, as a whole, retain their full expansion, points definitely to the existence of a peripheral fibroid of the lung, originated by plastic pleuritis or pleuro-pneumonia, and suggests adhesion of the opposed pleuræ beneath the points of depression.

When, however, the chest expansion is visibly diminished or suspended—the bony thorax being in a state of fixation —inspiration becomes essentially diaphragmatic. Under these circumstances, sinking of the suprasternal notch, the supra and infraclavicular and intercostal spaces, and of the epigastrian, synchronous with inspiration, points to a more diffuse and deeper fibroid, shooting from periphery to centre of the lungs, and drawing not only upon the interspaces of the chest wall, but also drawing upon the walls of the bronchi, and developing bronchiectasis. Again, resort to percussion and auscultation will verify these conclusions.

These fibroid areas and bronchial distortions cannot be

dissociated from the study of phthisis; they form a part of it, since they determine the recurring hyperæmia and catarrhal processes, which terminate in inflammatory infiltration and ultimate caseation.

One further phenomenon of the intercostal spaces, of exceptional occurrence, deserves mention. It occasionally happens in an emaciated chest, that the cardiac impulse, instead of presenting only the usual apex beat, perceptible in the fifth intercostal space, is equally distinct in the fourth, third and second incostal spaces. These interspaces to the left of the sternum are seen to rise and fall, synchronous with the action of the heart. The inference is plain, atrophy and retraction of the thin borders of the left lung, which usually overlap the heart, have taken place. This condition, as a rule, signifies the existence of advanced phthisis of the lung above and adjacent to the heart; and often there is a large antrum and collapsed lung; but I have once found it, where fibroid contraction only existed in the adjacent lung. The diagnosis of this condition is confirmed by percussion, since the normally small triangle of superficial cardiac flatness is increased to a large circular or irregular area, and further verified by auscultation, since all respiratory and conduction sounds are wholly removed from this area. I am not prepared to say, from the limited number of cases I have seen, whether this cardiac motion, visible in all four intercostal spaces of the præcordial area, warrants an inference of pleuro-pericardial adhesions. The cases I have seen have given no history of previous pericarditis, nor of local pleurisy.

The retraction of an atrophied, cirrhosed lung establishes direct contiguity of the anterior cardiac surface and the chest wall. The interposition of pericardial or even of intrapleural bands, therefore, is not essential to the production of this disseminated heart impulse, and we know that none such is required to transmit the localized normal apex beat.

Before dismissing the subject of chest inspection, I desire to state my views as to the causative relation of the non-development of the chest wall and its movements to phthisis. It is well known that the apices of the lungs are the most

frequent site of early phthisis. Yet nothing peculiar in the anatomical structure of the apices, or in their function, explains their greater liability to disease. Women are more prone to phthisis than are men, yet women have a greater development of upper costal respiration, or apex expansion, than do men. I believe that phthisis attacks the apices preferably, because,

1st. The apices are so frequently enfeebled by contraction of the upper part of the bony thorax, whether by want of muscular activity and development or by rounded shoulders, through carelessness and indolence, or through confining work at desk or trade.

2d. That the apex region in this enfeebled condition is soonest reached and most easily invaded by the frequent recurring catarrhal inflammations descending from the larynx and trachea.

3d. Because the apices, when invaded by hyperæmia or catarrhal processes, are not favorably affected by the energetic force of cough.

Cough is essentially a diaphragmatic act; it expends its force upon the lower two-thirds of the lungs, tending to clear the lower bronchi of contained mucus, and by compression of the parenchyma to remove their hyperæmic conditions. But this benefit is not extended to the bronchi and parenchyma of the apices. It is a fact that in cough, the glottis being in a measure constricted, the forcible currents of air, driven upward from the lower portions of the lungs by diaphragmatic force, are not permitted to wholly escape through the larynx, but are deflected into the bronchi and vesicles of the upper lobes. When this process continues too long, as in pertussis or chronic cough, from any cause, emphysema of the apices or upper lobes (obstructive emphysema) results. In the same manner I believe that cough by pneumatic pressure frequently detains or impacts catarrhal products in the tubes and vesicles of the apices, and renders them especially the seat of phthisis.

I shall not dwell on mensuration, since its essential features are established, and it affords but little diagnostic in-

formation. Asymmetry of the two sides of the chest, or a marked diminution of respiratory expansion, are to be interpreted subsequently by percussion and auscultation.

Palpation as a method of chest examination, while presenting many special details, is particularly valuable as relates to the subject of fremitus. Fremitus is especially instructive for negative diagnosis, often indicating the normal chest by a characteristic vibration communicated to the hands, which they cannot misinterpret. But fremitus may be feeble or almost absent in healthy but indifferently developed chests, especially if the patient's voice be treble. Fremitus may be weakened by rigidity of the bronchi. Fibroid areas may remove it, in whole or in part. Thickened pleura may remove it, or rarely increase it by conduction, depending upon the condition of the bronchi and pulmonary tissues. Finally the possibility of fremitus under these and all conditions depends largely upon the elasticity of the ribs. When by any cause, whether by senile calcification or by the inspiratory fixation of the thorax in emphysema, the ribs are held tense and rigid, fremitus ceases, no matter what the condition of the contained organs. Palpation therefore of itself does not afford valuable diagnostic information as to the state of phthisical lungs. Although most authors and teachers of physical diagnosis recognize the composite nature of the pulmonary percussion sound, and the several factors which unite to produce it, yet the impression still prevails that it is essentially the product and exponent of the underlying lung. It would be undesirable to detract in the slightest degree from the confidence reposed in the diagnostic value of percussion. But the exclusively pulmonary origin of percussion sound is easily disproved. This is most easily accomplished by a brief reference to the percussion note of emphysema. If, in emphysema, the percussion note were to correspond to the volume of air within the coalesced air-vesicles, and in the stretched infundibuli and dilated terminal bronchi, we should obtain by percussion the prolonged, low-pitched, tympanitic sound which the novice in physical diagnosis is always prepared to hear. To his surprise, the

sound, although possessed of some tympanitic quality, is curtailed in duration, and in its initial portion, at least, is raised in pitch. The explanation is simple. The emphysematous lung is an aggregation of fused air-vesicles and distended terminal air-passages; it is a dilated lung, with much of its elastic tissue absorbed and deprived of its expiratory contractibility. The overlying bony thorax is, therefore, in a state of inspiratory fixation, and so tense or rigid that it does not vibrate. Hence the contact of the percussing finger tips with a rigid thorax elicits a sound relatively high in pitch and devoid of vibration or duration. I will mention one further fact bearing upon this question. The middle and lower sternal regions overlie the anterior mediastinum, which contains the great vessels and also cover the body of the heart. Yet, in some elastic chests, percussion over the lower half of the sternum—the keystone of the elastic respiratory arch—elicits, not flatness, the product of underlying solid structures, but a sound essentially of pulmonary quality. The elasticity of the chest wall is undoubtedly an essential factor of, or contributor to, the percussion note.

However, it may be affirmed that raised pitch of the percussion note, especially at the apices, most frequently indicates lung condensation, either tubercularization or inflammatory infiltration. It may also mean thickening of the underlying pleura. But, on the other hand, when the chest wall is poorly expanded, whether by disuse and enfeeblement of the upper respiratory muscles, or when fibroid phthisis or bronchial rigidity have transferred respiratory action to the diaphragm, then the motion of the ribs lessens, and the disused ribs become more or less fixed. Under these conditions, percussion, over the entire chest, frequently elicits only an unsatisfactory and negative sound, devoid of diagnostic features.

Reversely, in many cases thickening of the pleura, of recent or remote development, may cause such absolute percussion flatness as to warrant the inference of a solidified, phthisical lung. We may conclude, therefore, that in contracted chests and in the mixed forms of early phthisis, per-

cussion leads to no positive diagnosis, until supplemented by auscultation.

But there is yet another physical sign, or differential test, to which I must call special attention. It may be regarded as a product of mediate percussion. It is in no wise connected with chest acoustics, but rather pertains to the subject of the thoracic innervation and the influence of pulmonary tissue waste upon the spinal centre. I refer to a special cutaneous reflex, which characterizes many, perhaps most, phthisical cases. It is so frequently present at the periods when caseation and secondary inflammations mark a case, hitherto uncertain, as one of phthisis, that it may be regarded when present as pathognomonic. As early as 1830, in the Dublin Hospital Reports, Vol. V., p. 70, Graves and Stokes described certain muscle tumors which appeared following direct percussion upon the chest "in incipient phthisis chiefly over the seat of irritation." Dr. Warburton Begbie observed and taught it as an evidence of phthisis. Dr. Lawson Tait, in 1871, in the Dublin *Journal of Medical Science*, Vol. LII., p. 316, described this phenomenon and designated it more classically as "myoidema," or muscle tumor. Prof. Gairdner and Dr. Finlayson, in the work of the latter, also allude to the diagnostic value of the sign, and properly add that "myoidema" and muscle tumor are misnomers, since this reflex is *of the skin alone;* that it is analagous to the contraction of the dartos of the scrotum; that it is best produced by quick strokes of two or more finger tips upon the costal cartilages, and is much less marked over the muscles of the intercostal spaces. I should hesitate to call, anew, attention to a point advanced so long since by Graves and Stokes, and which presumably had long since passed to oblivion, because tried and found devoid of significance, were it not that I have first carefully studied it upon several hundred chests at Bellevue Hospital and the Polyclinic. Being myself skeptical of its special relations to phthisis only, I have at the outset asked myself, as most of my students in physical diagnosis have asked me, if it was not present in all cases of emaciation, wasting disease, and slow con-

valescence. Hence I have sought to find it in the chests of convalescents from protracted and depressing typhoid, in advanced cirrhosis, in abscess of the liver, in hemiplegics and paraplegics, and, indeed, wherever disease had produced tissue waste. The result of my observations was, first, that it is usually present in established phthisis, where the long-standing and progressive intra-thoracic disease has wasted the body; second that it frequently exists in incipient phthisis; third, that it is exceptionally present in any other disease, and its presence in any such case justifies a suspicion of phthisis. In but one case, a convalescent typhoid, did it seem pronounced, and so exceptional was this case that though chest disease was not demonstrable, I felt that its early manifestations might soon appear. Again in cases of chronic bronchitis, bronchial dilation, and bronchiectasis, it does not appear, nor again in cases of thickened pleura, however extended; but when fibroid is developed, whether of bronchial, interstitial or pleural origin, so as to contract the chest and to cripple the lungs for respiratory service and lessen the nutrition of the body, it begins to appear. It is most pronounced when elevation of temperature, colliquitive sweating and bodily debility indicate pulmonary tissue waste and caseation. In advanced phthisis, with softening cavity and excessive muco-purulent sputa, it reaches its maximum. I usually percuss with a quick firm blow, with two or three finger-tips of the right hand, upon the costal cartilages of either side. Instantly two or three little conoidal tumefactions appear, rising to a variable height in different cases, ranging from one-sixteenth to one-eighth, or rarely one-fourth of an inch. Remaining fixed for a variable period, rarely so brief as a second, more often two or three seconds, they undergo a subsidence more gradual than the elevation, a vibratile, vacillating, interrupted recession, Graves and Stokes recorded a duration of four seconds and Tait one of twelve seconds. Finlayson speaks of it as "a peculiar momentary starting and elevation of the skin." Over the intercostal muscle it also can be produced. I have sometimes seen in the intercostal space an associated

reflex muscle wave which floated away towards the shoulder until lost; but this muscle reflex is not the peculiar reflex which has come to be known as myoidema, which is peculiarly a cutaneous reflex, a contraction of the arrectores cutis. It is not to be confounded with reflex of the thoracic muscles, any more than should cutis anserina, suddenly following a chill, or urticaria following irritation of solar heat or indigestion. In some well-pronounced cases of phthisis I have been able to develop myoidema behind in the suprascapular space, but especially in the interscapular space when broadened by Carson's shoulder position. Myoidema then is a cutaneous reflex. "Reflex hyperkinesis," we are told by Ross, "is caused by disease which increases the irritability, and consequently decreases the specific resistance of the reflex arc in any part of its course," etc. I have, therefore, so far as I have studied myoidema, come to regard it as of diagnostic value. I regard it a corroborative sign of existing phthisis, and as indicating the arrival of a case of phthisis at a point where the nervous system has become weakened, the vitality depressed beyond the point of resistance, and as marking the case as one tending toward an unfavorable result. If found in a case upon which I had hitherto looked hopefully, it would lead me to renew my examination for evidence of infiltration and caseation. I would ask observers of the chest to habitually apply this test and add their contributions as to its value or uselessness. At present, I am disposed to regard it as worthy to be added to the associated signs of pulmonary phthisis.

We come, finally, to the auscultatory evidences of pulmonary phthisis. Enfeeblement of the vesicular murmur, and its entire absence, have long been regarded as evidences of condensation of lung tissue, even when conduction sounds have not been raised in pitch; and when to absence of vesicular murmur are added bronchial breathing and broncophony, no doubt is left of the existence of an underlying area of infiltration. Were all phthisis, either *ab initio*, or even ultimately, tubercularization, or even disseminated interstitial infiltration, of inflammatory

origin, we might need no further combination of physical signs than absence of vesicular murmur and conductions of sounds raised in pitch. But every practitioner, and every teacher of auscultation, has frequently been confronted with cases where he found nothing definite, or a most obscure combination of auscultatory signs, rendering the above tests most unsatisfactory. This is explained by the fact that in mixed phthisis a combination of peribronchial exudation of fibroid, emanating from the bronchi or the periphery, and of pleuritic thickening, exists to make up the structures upon the expansion of which the development of the sounds depends, and which are also the media for their conduction. With reference to vesicular murmur, even in health, I am not at all sure that the majority of ears can disassociate it during active respiration, on the one hand, from the finer tubular friction sounds, or, on the other hand, from the sussurus of the thoracic muscles. I am almost certain that the vesicular murmur, or true respiratory murmur, as claimed to be heard during suspended breathing, or the holding of the breath at the height of forced inspiration—the suspension having in view to remove the tubular or friction elements of inspiratory sound—is often confounded with or masked by, the muscular sussurus, which is, like respiratory murmur, so characteristically low pitched, multitudinous and diffused.

The absence or modification of the vesicular murmur has always and properly been regarded as a first warning of phthisis. But the presence or absence, fullness of development or enfeeblement of the vesicular murmur, is not of so great value in differentiating the three forms of phthisis, and especially the relative proportion of each in mixed phthisis. The crippling lesions, in many cases, have so contracted the chest, have so diminished its expansion, and lowered the velocity and force of the incoming inspiratory currents, that but little respiratory sound is developed to be conducted. Under this embarrassment, however—the absence of respiratory sound—the phonated voice supplies us with a sound produced quite independent of chest rigidity,

diminished expansion, and enfeebled air currents. And thus, when considerable areas of pulmonary change exist, the voice, as it reached the ear, by its pitch and quality and degree of dissemination, tells of the media which have transmitted it. Thus the voice is high pitched when conducted through tubercular areas, in proportion to the size of the area and density of the consolidation; or it is rendered masked and distant in quality by transmission through moderate thickening of the pleura; it is faint or absent in exceptional cases of very thick pleura, though, *per contra*, in rare instances, a pleura of one-half or three-quarter inch thickness may conduct the voice sound with raised pitch. But the vibration of the bronchi, the lung parenchyma and chest wall, by the full voice, often gives no indication of the presence of the lesser lesions of early phthisis. The pronounced words, especially of low pitched bass or baritone voice, are reverberated and resonated with such force in the bronchi that they are unchanged in quality, and are brought to the ear scarcely modified in pitch. Such is the case in slight interstitial infiltration, or a peribronchial thickening, or limited fibroid; nor will slight thickening of pleura always modify the conducted voice, though the existence of such pleuritic lesion is evidenced by dullness on percussion. In such chests, then, in order to determine these lesser deposits, we still need, for conduction, a sound produced independent of the enfeebled chest expansion and slowed air currents, but more delicate and less voluminous than the voice. This we have in the whisper. I have for a long time come to regard the study and application of the conducted whisper as of equal or greater value than the study of changed vesicular murmur and conducted voice, and of far wider application in determining and differentiating the early steps of the three definite forms, and the many mixed cases of phthisis. 1st. The patient, directed by the physician, may utter a quiet, almost inaudible, low-pitched whisper, which in quality and volume supplies the place of conducted tubular and vesicular sound, and which latter are often absent in the contracted chests which we are considering; or, 2d, he may

whisper clearly and audibly; or, 3d, he may utter a short, abrupt, forcible, high-pitched, aspirated whisper, deficient in volume and duration, but of great intensity, a sound which preserves its characteristics unmodified by slight changes of tissue density, and capable of transmission through bronchial thickening and fibroid areas, when the feebler forms of whisper, like vesicular murmur would be unconducted and unheard. Thus, at the apex, the low-pitched whisper, changed by transmission through the pulmonary media to a high-pitched sound, is diagnostic of incipient infiltration. The non-conduction of such a low-pitched whisper—silence only—or the distant transmission of a high-pitched whisper, when associated with transmission of the voice, unchanged in quality and pitch, point to peribronchial thickening or centric fibroid of limited extent. But the non-conduction of both the low and high-pitched whispers, and a distant feeble conduction of the voice point to a fibroid nearer the surface or progressing inwards from a thickened pleura.

Finally, the ear, applied over the chest, often cannot detect differences in adjacent areas, as lobular consolidation. By the substitution of the smaller tube of the stethoscope, and uttering the incisive, high-pitched whisper, close comparison of adjacent limited areas, as contiguous lobules, can be made to great advantage. Chest vibration—an objectionable element, diffusing and disseminating sounds —is excluded by substituting whisper for the too energetic voice, and very direct conduction, by each underlying area, is secured.

I also especially value the whisper tests, for so I have come to regard and call them, in distinguishing a healthy lung from one but slightly diseased—a question so often forced upon us by the existence only of failing health and narrowed chest. The low-pitched whisper possesses too little force to vibrate the healthy lung, or, reversely stated, the healthy lung is such a poor conductor of sound that the ordinary low whisper sound is dispersed in the ærated lung, and does not reach the chest wall and ear, or but feebly. As a negative sign, therefore, in examination of weak chests,

it is of greatest value, and will rank as does absence of expiratory sound, as an indication of healthy lung.

The diagnostic significance of conduction of the tubular elements of respiratory sound, high pitched in inspiration, and prolonged and high pitched in expiration, needs no elucidation. When marked it is diagnostic; but when it is not marked, when, as already stated, by reason of defective chest expansion, no bronchial tubular sound is developed, or it is developed but feebly, in that class of cases where the physician listens and hears little or nothing, the whisper still remains adaptable for each case and each form of phthisis, and is diagnostic. I have not alluded to the coexistence of cavernous breathing, retarded blowing, expiratory sounds, the presence of dry or moist râles, and the many other associated signs by which diagnosis is facilitated and confirmed, as I have not aimed to discuss the entire question of chest acoustics as applied to phthisis, but rather the methods which I regard most essential, including methods that are too little discussed and practiced.

A detailed examination in the light of our present knowledge of the pathology of phthisis, and by the systematic steps of inspection, palpation, percussion and auscultation, even when supplemented by the family and personal history, and the existing symptoms, will, combined, in many cases, fail to lead up to a final diagnosis. Renewed and patient examinations will be necessary from time to time, under new circumstances of changing symptoms and pathology. The occurrence of an hæmoptysis is often the occasion of a first examination of a hitherto unsuspected or a long-neglected chest. The physical signs are widely different during the first hours of the days succeeding an hæmoptysis. At the time of its occurrence, gurgles and râles may mark the site of the gravitated blood, or possibly the area from which it escaped. Within a few hours arrest of hemorrhage and coagulation of the blood may remove these râles. Possibly a local area of muffling of all sounds, with or without dull percussion note, may mark the area of hyperæmia. In twenty-four or forty-eight hours the developement of râles

may give evidence of local catarrhal process, or we may find the crepitus of a local pneumonic process. Finally, in some cases, no physical signs exist, the hemorrhage having acted to relieve a hyperæmic area.

One further and final point: In the study of incipient phthisis and weak lungs, no more important problem presents itself in exploration of the chest than the interpretation of local areas of subcrepitus, especially if co-existent with dullness on percussion and bronchial breathing, bronchial whisper, and broncophony. It was one of the errors of the past to interpret such subcrepitus in consumptive lungs as indicative of the process of softening.

We can pretty safely say to-day that there are no auscultatory evidences of softening, except those grosser and manifest sounds, the changeable râles and gurgles associated with forming cavity. The area of caseation and softening cannot originate sounds until communication with a bronchas has been established.

Subcrepitus, it is true, is often associated with softening, but is not in any sense the result of the action of respiratory currents on softening cheesy matter. Subcrepitus when local over phthisical areas, if low pitched and remote from the ear, denotes local capillary bronchitis, or more often hyperæmia and bronchorrhœa, a transudation of serum or seromucus into ultimate bronchial tubes. It is then a result of obstructed circulation and collateral hyperæmia. If, however, the subcrepitus be high pitched, brilliant, explosive, and manifestly directly under the ear, it is plainly interpleural. It then denotes that the infiltration of the lung has reached the surface, and given rise to secondary local pleurisy, or that the patient from exposure has contracted a local plastic pleuritis.

In all disease the effort of the physician should be specially directed to arriving at an early and accurate diagnosis. Prognosis and treatment cannot be of value except they be preceded by a correct conception of the pathogenesis of the malady and the departure from normal conditions which the affected structures have undergone. This proposition is re-

garded as especially true of systemic diseases the product of specific infection and sepsis. Yet these diseases often have a period of self-limitation, and progress by stages towards recovery, or are thrown off by an eliminative effort of the system, or can be successfully combated by specific agents, or rendered harmless, until their force is spent, by antipyretics and antiseptics.

But with reference to pulmonary phthisis, it may truly be said that the usefulness of the physician is greatest in the care and restoration of the enfeebled chest, and in the management of chests already invaded by one or other of the wasting processes.

The fully-developed consumption is so difficult to combat that it is an *opprobrium medicinæ* that so little can be done. While then we are divided as to the pathogenesis, whether phthisis is disseminated through the lungs by the lymphatic capillaries; whether it is of inflammatory origin with subsequent sepsis by softened cheesy matter, or is specifically produced by colonies of bacteria, we may all agree that the suspected and involved areas should early be studied and differentiated.

CONTAGIOUS OPHTHALMIA IN SOME OF THE ORPHAN ASYLUMS AND RESIDENTIAL SCHOOLS OF NEW YORK CITY.

By RICHARD H. DERBY, M.D.

BEFORE asking the attention of the Academy to a paper of some length on the subject of "Contagious Ophthalmia in our Asylums and Residential Schools," the writer desires to state that the interest attaching to this subject is not of a purely scientific nature but appeals to the hearer on the three-fold ground of Philanthropy, Medicine and Social Science. The writer also holds that no one familiar with the subject will deny that contagious ophthalmia is a disease as dangerous to sight as scarlet fever and typhus and other contagious diseases are to life and health, and that the welfare of those who have been adopted by our public institutions, and for whom we are in great measure responsible, demands some system of quarantine or medical supervision, which shall not only insure recovery to those already afflicted but which shall afford ample protection to those who have thus far escaped contagion.

There is probably no gentleman here present, who has given particular attention to diseases of the eye, who will not bear witness to the fact that any child who is an inmate of our public institutions is far more likely to lose his sight from the inroads of contagious ophthalmia than to lose his life from scarlet fever or any of the diseases which are subject to quarantine regulations by the Board of Health.

The writer would further state that, whereas the dangers from neglect are comparatively great, the disease itself is perfectly amenable to treatment; and the reward which is to be expected from an *adequate* appreciation of and attention to the exigencies of the case is such as to render further neglect of the subject entirely inexcusable. This is his apology, if apology is necessary, for asking his hearers to follow him in the exhibition of statistics which on a more trivial subject would be considered dry and uninteresting.

In October, 1884, the writer of this paper prepared for the Committee on Hygiene of the County Medical Society a report on contagious ophthalmia in three of the asylums of this city. Since that time many other institutions have been visited and the inmates examined, and we are now able to present a summary of results obtained from the examination of 7,440 children, the entire number contained in 24 orphan asylums and residential schools of this city. Before detailing the results of these investigations, a brief description of the disease we are considering may be permitted. Blenorrhoic conjunctivitis in its chronic form is characterized by injection of the conjunctiva of the eye-lids, hypertrophy of the papillary bodies, and secretion of a purulent or a muco-purulent nature. The conjunctiva tarsi of the fold of transmission, the semilunar fold, are in general the seat of the disease, while the conjunctiva of the eye-ball may and generally does in the earlier stages of the disease escape.*

The secretion is contagious. At an early period of the affection the meibomean glands are no longer to be seen upon eversion of the lids; later on the swelling of the semilunar fold increases, as does that of the fold of transmission; the inner canthus ceases to be sharply defined; the tear-points are disturbed in their position and the passage of the tears interfered with. If the disease progresses the conjuntiva of the sclera participates in the affection; it becomes injected and shows serous infiltration, and at a later period these symptoms are intensified, the ocular conjunctiva become swollen, the lids can with difficulty be everted, there

* Graefe and Saemisch. IV. Band., pp. 76 and 79.

is chemosis—the cornea is now in danger. Pressure of the swollen lids and of the chemosis upon its nutritive supply lead to ulceration upon its surface, and unless relief in some way is found, perforation of the cornea and consequent prolapse of the iris may ensue.

Blenorrhoic conjunctivitis in a vast number of cases remains an affection of the conjunctiva of the lids, and does not advance to the later stage which we have just briefly described. It passes for a catarrhal affection of the eyes, and as such is treated; or it exists, and this is often the case, without receiving any medical attention whatever. We have spoken of the secretion from a blenorrhoic conjunctiva as contagious. It may be transferred from eye to eye by means of a towel; it may be conveyed in the water used for washing; the atmosphere itself may be the bearer of the contagion.

Among soldiers in their barracks; in the crowded holds of vessels; in the overfilled homes of the poor; among the inmates of large institutions, contagious ophthalmia has been found, and as our investigations will show, an especially fertile field for this disease so full of danger to the eyes exists in the orphan asylums of a great city. In an experience of fourteen years as officer of one of the largest ophthalmic hospitals of the country, the writer has over and over again had children brought to him from some of our city institutions with their sight irreparably damaged, and with the sad statement, doubtless true, that before they were taken from their homes their eyes were perfectly sound. It was with a view of seeing how far this malady might exist among the children cared for in the asylums of this city that the investigations now detailed were made.

The first asylum visited stands on one of the broad avenues of the city, on high ground. The children were examined in their class-rooms, and subsequently their dormitories and lavatories were visited. Among the boys, of whom there were 326 present, were found 96 cases of contagious ophthalmia; among the girls were 65 cases out of an attendance of 331, making a total percentage of 24.5 per

cent. In almost all the cases here found the disease was in what we have described as the first stadium. In many cases the appearance of the eyes before eversion of the lids betrayed no sign of the malady which was present. In certain cases the child or its attendant remarked that it had from time to time a cold in its eyes, nothing more. Occasionally, where the blenorrhoic process was most strongly marked, neither child nor attendant seemed aware that anything was wrong. In the dormitories each child had its own bed; in the wash-room, separate towels hung upon numbered hooks, and no basin was used; small jets of water, at intervals of a foot along a horizontal pipe placed above the sink, furnished each child with its supply for washing. In the boys' asylum a large sunken tub, perhaps ten feet long, was prepared for the bath, and in this eight children or more at a time were bathed. [Eight years ago I visited this same institution with the late Mr. Theodore Roosevelt. The object of the visit was to ascertain to what extent contagious ophthalmia then existed among the inmates. The notes of that examination were not preserved, but a large number of children were found then to have sore eyes. In the lavatories were a few roller towels hanging on the wall, and these were used by the children indiscriminately, those that had eye trouble and those that were well. It was in consequence of representations we then made that the children were thereafter supplied each with its own towel.]

The next asylum, which we may designate as No. 2, showed among 1586 inmates 488 cases or 30.7 per cent of contagious ophthalmia. In No. 3 were 782 inmates; of these 111 had sore eyes or 14.2 per cent. In the lavatories hung on the walls 25 roller towels, and these the attendant said were changed two or three times per week.

In No. 4 were 188 children, and of these 93 or 49.4 per cent. had sore eyes. In reference to the condition of things at this asylum I make the following extract from a letter received May 27th, 1885, from the physician in attendance: "When you made an official visit to our institution in 1884 you found 92 children suffering from a contagious type of

ophthalmia * * * * At your suggestion the sore-eyed children were separated from the others, and subjected to a daily course of treatment for a period of five months. The present time of writing, I give the result. Forty-two of the ninety-two are cured. Fifty of the whole number in the institution are still under treatment * * * Two children never occupy the same bed. A towel and brush is supplied to each individual. The bathing facilities are of the best, and the grounds are ample, and the children have an abundance of out-door life. The dietary is excellent, and in a family of 200 it is but seldom that a child is so ill as to require the aid of a Physician."

In asylum No. 5 were 740 inmates, and among them 71 cases or 9.5 per cent. Here we found two large rooms with two immense bath tubs in each, about which 260 boys stand twice or three times a day and wash at a spiggot, and then go irregularly to one of the 60 roller towels that hang on the walls of each room.

In asylum No. 6, out of 96 inmates were 26 cases or nearly 37 per cent.

In No. 7 were 15 cases among 262 or 5.7 per cent.

In No. 8 were 445 children, and of these 74 had sore eyes, or 16.2 per cent.

In No. 9, out of 155 children 5 were affected or 3.2 per cent. Each child was supplied with its towel.

In No. 10 were 240 children; there were 15 cases of sore eyes, or 6 per cent. These children were for the most part committed by the courts. Each child had its own box, containing towel and brush.

In No. 11 were 21 children, and no case of granular ophthalmia.

In asylum No. 12 were several buildings.

In the first one visited I found 80 boys, in age from 4 to 8. Of these were 47 cases of contagious eye trouble. The cases were mostly severe, with free secretion. Of 164 girls there were 80 cases of similar type. Louisa M., aged 4, came to me the day before, at the New York Eye and Ear Infirmary, with left eye in condition of central cor-

neal perforation, and extensive prolapse and acute granular ophthalmia. The mother said the child had gone into the asylum with good eyes, and had been there one year. The sisters in charge of the asylum remembered the case, and said they had sent the child out to have her eye operated (sic). The eye was beyond hope. Of 178 boys were 56 cases. Of 29 infants under three years were 21 cases. With these last the practice of the attendants was to use two towels, one for the sick, the other for the well eyes. In the case of the older children each had its numbered towel. To summarize: among 451 children were 204 cases of contagious ophthalmia, or 45 per cent. There was every evidence of over-crowding in this asylum; no plan had been or apparently could be adopted for isolating such children as suffered from this grave disease. The sisters in charge stated that they must receive all the children that were sent to them, whether they had sore eyes or not, as they were for the most part commitments. The general physique of the inmates was not good, and the evidence their evening meal gave of the dietary was not encouraging.

In marked contrast to this was asylum No. 13. The fine physical condition of all the children was noticeable. Each child had its own brush, comb, tooth-brush and towel. The towels were changed twice every week. Of 104 inmates were six cases, or 5.7 per cent.

In No. 14 were 310 boys, and of these were 73 cases, or 23.5 per cent. The large building in which these boys were cared for furnished each child with a small wire-screened compartment, in which stood his bed and wash-stand. In the infirmary were fourteen children, all with recognized sore eyes, but the fifty and more cases found among the larger boys had received no attention, so far as inquiry among the boys and their attendants showed, from the medical officer of the asylum.

In No. 15 the children were found distributed in cottages, each child with its own towel, brush, etc. Of 151 children there was one case, or less than one per cent.

In No. 16 the children were arranged as in No. 15. There was one case among 122 children or .08 per cent.

In No. 17, the asylum a large and spacious new building, the children were well cared for. Among 399 children were seven cases or 1.7 per cent.

No. 18 contained 245 children, and among them were forty cases of contagious ophthalmia, or 16 per cent. In the nursery department were half a dozen towels used at the discretion of the attendants. In the wash-rooms for the older children hung numbered towels.

In No. 19 were 98 children and young women, and among them were two cases of contagious ophthalmia, or about 2 per cent. The dormitories were spacious, well ventilated, and each inmate had its own towel.

In No. 20 were 120 girls, and among them six cases or 4.8 per cent. Each child had its own numbered towel.

In No. 21 were 132 girls, and among them 21 cases or 15.9 per cent. The school-rooms and dormitories were dark and badly ventilated. Each child was provided with its own towel.

In No. 22 were 18 girls between the ages of six and thirteen.

In No. 23 were 22 young women. In neither asylum were any cases. Both of these asylums were in private hands, and the inmates cared for in ample, commodious houses.

In No. 24 were 82 children and among them eight cases, or ten per cent.

The communicable eye diseases observed in these investigations have been designated under the general term of contagious ophthalmia. Among them were those where the true granulations, the so-called trachoma of Arlt, were present; others that might be more properly described as chronic conjunctival blenorrhœa. In some, the affection had extended to the cornea, producing pannus, and in certain cases corneal ulceration had been followed by prolapse of the iris and adhesion. In striking illustration of the communicability of the disease, it was often noticed that when a

pronounced case was found, a group of children presented themselves in succession with the same trouble, and these were children who habitually in the class-room occupied adjacent seats. It is not the purpose of this paper to consider in detail the various causes which lead to the development of contagious eye diseases in the asylums which have been visited. The part played by imperfect quarantine, bad lavatories, over-crowding, bad hygiene, all this has been discussed in other places.*

My purpose in these investigations will have been attained if I have drawn attention to the fact that in the asylums of our city, where children in large numbers are housed, and where the inmates are taken from the over-crowded, illy ventilated, unhealthful homes of the poor, there exists to an alarming extent a disease fraught with danger to the eyes of all assembled there. We have seen that this affection may be present without attracting the attention of the lay attendants of the children, without calling for or receiving the care of the visiting physician of the institution. In certain cases, it is true, if the subject is well nourished and the hygienic surroundings good, the eye trouble disappears without treatment. In, however, too many cases, the disease which has once established itself goes on insidiously undermining the health of the eyes, and there comes a period when the affection is acute and we hear of an epidemic of contagious ophthalmia. Fortunate, then, are the unhappy inmates of such an institution if many eyes are not lost before the disease can be controlled.

The statistics taken from these asylums are appalling enough. We have found among 7,440 children that 1428 or 19.19 per cent., nearly one out of every five, had communicable eye disease, which he was liable to transfer to his neighbor. Nor does the trouble cease here. As has been observed in several of the institutions we have visited, so soon as an unusual number of children are found to suffer from sore eyes, it is not an uncommon practice for those who have the

* State Board of Health of New York, No. 44.

children in charge to send back to their former homes the worst cases, with the statement that it is better that, until the child recovers, treatment should be procured outside of the institution. Only those who are familiar with the homes of the poor in a great city can appreciate what a hardship is now wrought upon the unhappy guardians of such children. It is impossible that a child afflicted with contagious eye disease should receive in its tenement-house home adequate treatment. This class of cases is often refused shelter in our best-equipped eye infirmaries. The child must be brought three times at least in the week to the clinique for out-door patients. The already over-taxed parent must see to it that this frequent attendance is not neglected. The child becomes a fresh centre of contagium in the crowded, illy cared for home, where the food supply is scanty and the simplest rules of hygiene are neglected. The case must often be neglected, and neglect means advance of the morbid process, permanent, irreparable damage to the eyes.

Were there time in this report it would be proper to show how, by reason of a per capita allowance from city or state, it is in many of the institutions a pecuniary advantage to the asylum itself to receive as many children as possible within its walls,and overcrowding is thus directly encouraged. In many asylums children are committed by the civil authorities and in others by charitable societies, whose object is the protection of their charges from cruelty at the hands of their natural guardians. Can a more refined cruelty be imagined than one which subjects a child with healthy eyes to the dangers which every epidemic of contagious ophthalmia carries with it?

This present report covers but a portion of the asylums of this great city. There are many others that we have not visited, which would doubtless contribute their considerable quota of cases of communicable ophthalmia.

To meet this evil certain conclusions force themselves upon us.

Under no circumstances should children be received in an asylum until a competent authority has pronounced the

eyes of the new comers free from any trouble of a contagious character.

Every asylum and residential school of the city should be called on to furnish to the Board of Health a statement certified to by its attending physician of the number of cases of contagious eye disease at present within its walls. These cases should be separated from the other inmates of the asylum, and this quarantine should be rigidly enforced, so long as a single case of this disease is observed. Adequate treatment must be supplied, not merely local treatment for the eyes, but such allowance of food and air as are necessary for the proper treatment of such cases.

No less precaution for the safety of other inmates of these institutions should be taken when contagious ophthalmia is found to exist than is now observed when a case of scarlet fever is recognized.

It is impossible to read the statistics which have been presented in this paper without acknowledging the fact that a great evil calls urgently for prompt and systematic action for its relief. What shall be done and where shall the beginning be made? Our present inquiries have brought to our knowledge enough cases of contagious eye disease to more than fill a large hospital devoted to this particular class of diseases. If such a hospital existed it would undoubtedly soon reduce the percentage of such troubles to a minimum. Such a hospital would receive and care for all cases of communicable eye disease, until they could be returned cured to the institutions from which they were gathered. While we may not ourselves establish and maintain such a hospital, it behooves us as members of the Academy to make emphatic protest against the continuance of the present dangerous and inhuman practices which we have found at many of our city's institutions. Hoping that the members of the Academy here present will deem this matter worthy of their serious attention, I take pleasure in submitting it to them for consideration.

OBSCURE CASES OF WEAK HEART.*

By R. VAN SANTVOORD, M.D.

WEAKNESS of the cardiac muscle, occurring independently of valvular lesion, is recognized as an important pathological factor in a large number of morbid conditions. It is one of the chief sources of danger in most acute febrile diseases, and it remains as a residual disorder after many of them, particularly after typhoid fever. It occurs as a result of long-standing anæmia, and of various toxic conditions, among which alcoholism is prominent. Failing cardiac compensation is frequently the cause of death in chronic renal disease. The right ventricle is often affected in pulmonary diseases involving obstruction to the lesser circulation. Degeneration may result from inflammation of the cardiac muscle occurring in the course of various general diseases, or as the secondary result of the lesions of coronary vessels. The heart may give out as the result of repeated strain. The heart muscle itself, after death, may be in a state of granular, fatty, fibroid or waxy degeneration, as the result of one or other of these conditions, or its histological structure may be apparently normal, although the ante-mortem history and the dilated cavities of the organ point to cardiac failure as the cause of death. It is not my intention to attempt the impossible task of covering this wide field in a single paper. Many of these cardiac conditions are among the best recognized features of the general morbid states with which they

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* Read before the New York Academy of Medicine, Oct. 1st, 1885.

are associated. In others again the connection between symptoms and the underlying cardiac lesion is obscure and easily overlooked from the absence of striking physical signs of cardiac disease. It is my purpose to confine my attention to this latter class of cases, considered from a clinical point of view. As a positive diagnosis can frequently be made only after careful study of the individual case, and balancing of the various symptoms and physical signs observed, it has seemed to me that my not very easily circumscribed subject could be most suggestively presented by the relation in brief of a few cases which have come under my personal observation, with comments upon the special points of interest which they present.

I.—My first case was that of a fresh-looking, slightly corpulent man aged forty-two, who was apparently the picture of robust health. He was a dry-goods salesman by occupation, and beyond occasional drinking with a customer, and too rapid eating, his habits were in every way good. His indulgence in alcohol was never excessive. He complained of sleepiness. It was difficult to rouse him in the morning after a full night's rest. He would frequently fall asleep at any time during the day when not actively occupied. He suffered from frequent headache which glasses, prescribed by an oculist to correct hypermetropia, relieved but little. He was forgetful and not able to attend to his business as well as formerly. On being questioned, he recalled that he was somewhat short of breath on going up-stairs, but had not been much annoyed by this symptom. He suffered also at times from slight disturbances of digestion. His urine was normal. The only evidence of organic derangement discovered was that the heart-sounds, especially the first, were rather weak, and reduplication of the second sound was audible at the base. The pulse was 75. The patient's symptoms dated from a severe attack of pneumonia two years previous to my attendance, his health having been good prior to that time. A diagnosis of weak heart following pneumonia was made and ten minims each of the tincture of digitalis and tincture of nux vomica, t.i.d., were prescribed, the

latter being given to correct existing derangements of digestion. After two weeks of this treatment the heart-sounds were louder but the patient's condition was not materially improved. A single sphygmographic tracing showed no obvious abnormality and was not preserved. Five grains of the citrate of caffeine after meals was now substituted for the digitalis, and $\frac{1}{80}$ gr. of strychnia for the nux vomica. Owing to a misunderstanding the caffeine was at first taken before meals and caused much gastric distress. When the mistake was corrected the good effect of the drug at once became manifest. His heart-sounds became louder, and his disagreeable symptoms disappeared. At first, if he forgot a powder, the sleepiness would return. After two or three weeks the dose was reduced to 3 grs. and was continued for a week or two longer. Ten weeks after commencing the caffeine treatment he had retained his gain but had to take an occasional 3 gr. powder to avoid sleepiness. His weight had been slightly reduced, and a tendency to flatulence was controlled by abstinence from sugar and potatoes. When last seen, twenty-three weeks after the commencement of treatment, he was in a comfortable condition, though still slightly short of breath, and flatulent from dietary indiscretions. His sleepy attacks had recurred two or three times under strain, but had quickly yielded to caffeine taken without consulting me. The only abnormality noticed about the heart was the persistence of the reduplication of the second sound, which was heard at the end of inspiration and beginning of expiration over the third left intercostal space near the sternum.

II.—My second case was that of a stock-broker aged thirty-eight. Several relatives had been gouty and one had been asthmatic. He had had several slight attacks of gout. He had been much worried about business losses and had been drinking freely, chiefly spirits, for three or four years. He had been short of breath for years on going up-stairs. A former medical attendant had found albumen in his urine. His ankles would become puffy from time to time especially after drinking brandy. He had been rejected by a life-in-

surance examiner some months before on account of the rapidity of his pulse. He had for some time vomited every morning on rising, the matter vomited being usually mucus, but twice it contained blood. His custom had been to take from twelve to fourteen drinks of whisky a day, and to eat only one meal, that being in the afternoon. I was called to see him on account of attacks of dyspnœa and wheezing, which had been coming on every night for some time. I found him to be a pale, worried-looking man, gray and appearing much older than he was. At my first examination the dyspnœa was slight. The lungs were normal. The first sound of the heart was weak, the second, hard, metallic, and not quite clear. His tongue was coated and he complained of flying pains in his muscles. The urine contained a small amount of albumin, had a specific gravity of 1024 and one fatty cast was seen after considerable searching. Six days later, after appropriate treatment of the stomach, the stopping of alcohol, administration of food and the use of morphia and Hoffman's anodyne at night, great improvement followed. He passed something over a quart of urine

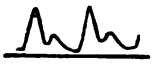

FIG 1.

FIG. 2.

of a specific gravity of 1014 in twenty-four hours containing no albumin. As soon, however, as he began to go about again, dyspnœa and inability to lie down without distress recurred. The first sound and the apex beat of the heart were feeble, the pulse 102. His appetite began to fail again. He had occasional shooting pains from the apex of the heart to the scapula. Ten minims of the tincture of digitalis, t.i.d., combined with a bitter tonic were given, as were also remedies rendered necessary by the condition of the stomach and bowels. In two days he was able to sleep flat on his back through the night. His pulse dropped from 102 to 84. Its tension which, as shown by the sphygmograph, was very low before the digitalis was given (Fig. 1) increased considerably (Fig. 2) but did not become normal.

He succeeded in abstaining from alcohol, and when examined six months later had gained remarkedly in flesh, no longer suffered from dyspnœa and, in spite of constant business worry, was in a very comfortable general condition. The first sound was still, short, and valvular, the second metallic and sharp, the arterial tension low, the pulse 62. The urine showed a faint trace of albumin, by Tanret's test, and a considerable number of hyaline casts.

In this case the patient's abuse of alcohol and underfeeding had undoubtedly caused a pretty general degeneration or state of malnutrition of all his organs. Reform of these habits was the *sine qua non* of his recovery. His rapid and persistent improvement after a course of digitalis, with corresponding improvement in his cardiac action, is proof, however, that his heart was the organ predominantly affected. The normal quantity of his urine, the small amount and inconstancy of the albumin which it contained, the absence of elements in the deposit pointing to active kidney trouble, the persistent low tension of his pulse, and his rapid improvement, go to prove that the albuminuria was probably not associated with grave organic changes in the kidneys. The lesion in this case is conjectural. From the association with abuse of alcohol it may be assumed that the heart was fatty, but the very rapid response to digitalis seemed to indicate that a less grave state of malnutrition probably predominated. There was also a persistent irritability of the heart due apparently to his mental worry, and analogous to the irritability noted by Da Costa * as the result of the physical and moral hardships of campaign life, the abuse of tobacco, etc. It is, I believe, customary to regard these cases of irritable heart as of little gravity. Da Costa, however, has recorded a case of dilatation and hypertrophy following irritable heart due to worry and uterine disease, and also a case of dilatation and hypertrophy with mitral regurgitation following irritability from the abuse of tobacco and worry. Similar cases have been recorded by other authorities.

* Toner lectures on Heart Strain, 1874.

III.—My third case is that of a gentleman aged fifty-four years, who had always been much addicted to out-door sports. His health had been good until his present trouble began, except that he had always suffered from constipation. Some months before consulting me he began to suffer from lassitude, drowsiness, indisposition to exert himself physically or mentally, and a constant distressing headache felt chiefly at the vertex. He had been treated for hemorrhoids by ligature a few months before. His eyes had been recently examined by Dr. Knapp who told him that they presented the lesions usually associated with myopia, but nothing to explain his general symptoms. For a long time he had been obliged to get up at night to urinate. The immediate occasion of his consulting me was an unusually severe attack of pain in the vertex and back of the head, in fact shooting in character but not following any definite nerve distribution.

The patient was a thin, sallow, anxious-looking man. His tongue was slightly coated. His appetite was good. The apex of his heart was in the sixth interspace in the nipple line, and a very faint systolic murmur was heard at that point. The cardiac sounds, especially the second, were weak. The lungs were normal. He passed about 96 oz. of urine in twenty-four hours, the specific gravity of the specimen measured being 1010½. It contained no albumin. A mixture containing bicarbonate of soda and gentian, given for two days with the idea that the head symptoms might be reflex from the stomach, produced no effect. Of various remedies used for the bowels Faradization only had any effect. Ten minims of the tincture of digitalis, and twenty of the tincture of the chloride of iron, t.i.d., were now prescribed. During the twelve days that the patient remained under observation the heart-sounds increased markedly in force, the pulse became stronger, and his general condition improved remarkably. The urine fluctuated in specific gravity between 1010½ and 1019½ in four examinations. Its frequency of passage and presumably its quantity did not diminish. No albumen or sugar was found. On

one occasion a few hyaline casts with adherent epithelial cells were seen, spermatozoa were observed in three of the four examinations, and a few pus globules were always present. It was then ascertained that the patient had been treated for urethral stricture, originating in the usual way, thirty years before. A No. 14 English sound was the largest that could be passed through a constriction 2½ inches back of the meatus. Seminal emissions had occurred and ejaculation had been painful of late years. From the enlarged heart and the large amount of urine passed, it was concluded that the patient was suffering from contracted kidneys with secondary cardiac failure, although the specific gravity of the urine was usually normal and no albumin was, at any time, found. The patient spent the winter in a southern climate, and remained in a fair state of health, taking no treatment during most of the time, but avoiding exposure and muscu-

FIG. 3.

lar strain. A year after his first course of treatment he presented himself, stating that he was a little short of breath on going up stairs, that he had no pains but only a sensation of something not quite right in his head which he could not define, and occasional shooting pains in his arms and legs. His condition was somewhat aggravated by recent unusual exertion. The apex of the heart was in its former situation; the sounds, especially the second, were weak; a distinct reduplication of the first sound was heard to the left of the sternum at the level of the fourth rib, but not at the apex where the muscular element seemed to cover it. There was no murmur. The sphygmographic tracing (Fig. 3) was of very large amplitude but the tidal wave was more marked, the aortic notch much higher in the tracing and the dicrotic wave far less developed than in the case II. The pulse was 75. Digitalis in ♏x doses, t.i.d., first alone,

and after five days with ʒ ss of fluid extract of ergot, continued for ten days, caused a diminution in the amplitude of the pulse, a lessening of the dicrotic wave and a lowering of the pulse to 64. The sphygmogram, after this treatment, differed from the most common healthy type only in being a little below the average tension. The shooting pains became somewhat less under treatment, but there was no great change in his at this time not very marked disagreeable symptoms, owing probably to unusual exertion and the temporary discomfort of an acute coryza. The urine, examined once, had a specific gravity of 1015, contained no albumin, and the microscope showed only a few pus and red-blood globules. He passed 70 oz. in the twenty-four hours.

The facts that the patient had held his own for a year, that the specific gravity of the urine was normal (considering the amount passed) and that the sphygmographic tracing, taken on four different occasions, showed low arterial tension, even after the part had been strengthened by appropriate treatment, led me to conclude that polyuria was due to some cause other than contracted kidney, it being possibly a reflex result of the urethral lesion such as was observed by Masson * in four per cent. of the cases of stricture studied by him. Masson found polyuria especially in patients with stricture of long standing. After treatment of the stricture the polyuria disappeared or lessened. My patient did not remain under observation long enough at any one time to enable me to test this question by treating the stricture.

The cardiac failure therefore seemed to be an independent matter. The age of the patient (fifty-four years) pointed to an early stage of one of the chronic degenerative processes. His addiction to athletic sports suggests the weak, dilated heart without recognizable histological change such as has been noticed by Münziner † among the Tübingen vine-dressers who are accustomed to carry heavy loads on their backs in a hilly country, or the cardiac dilatation ob-

* V. and H. Jahresber., 1880, ii., p. 216.

† Des Pübingen Herz, Arch. für Klin. Med., Vol. 19, p. 449.

served after Alpine climbing,* but any absolute conclusion on this point seems impossible.

IV.—My fourth and last case can hardly be classed as one of obscure cardiac weakness as the symptoms were very striking. I introduce it on account of certain features of especial interest which it presents. The patient was a boy of fourteen, who had a severe attack of measles last May, he having been previously in good health. After his convalescence he suffered from dyspnœa and lancinating pain in the cardiac region after running. He was admitted into the Randall's Island Hospital on July 30th. The boy was thin and pale. Cardiac pulsation was marked over the apex, in the epigastrium, and in the left second intercostal space.

Both ventricular areas were enlarged. The heart-sounds were loud. Distinct reduplication of the second sound was audible in the third left interspace near the sternum. A loud blowing systolic murmur was heard over the arteries at the base of the neck and was transmitted into the brachials and femorals. Under iron, strychnia, and rest, the boy's general condition improved; the dilatation of the heart had diminished; the arterial murmur had disappeared; the veinous hum had lessened, and the reduplication of the second sound still persisted at my last examination.

Although endo-carditis and peri-carditis occur as occasional complications of measles, the absence of cardiac murmurs and the rapid improvement, both local and general, point to the condition as one of cardiac dilatation with perhaps some fatty degeneration such as has long been recognized as occurring in long-standing anæmia, especially in chlorosis, the dilatation sometimes proceeding so far as to cause relative incompetence of the mitral valve.

On reviewing this little group of cases attention is arrested by the fact that reduplication of one or other of the cardiac sounds was present in three of them. The etiology of this phœnomena has been much discussed. The simplest explanation is, that the reduplication of the first sound is due

* Overstrain of Heart and Aorta (with distension). Albutt, Brit. Med. J., Mar. 15, 1873.

to asynchronism in the contraction of the ventricles; that of the second, asynchronism in the closing of the aortic and pulmonary semi-lunar valves. Bramwell is of the opinion that this is the explanation in at least the great majority of cases. Other high authorities have invented a number of ingenious hypotheses to meet certain cases in which there are apparent objections to this simple theory. These alternative explanations, being apparently incapable of *experimental* proof or disproof, must be accepted or rejected on purely theoretical grounds. None that I have met with seem to my mind mechanically possible. Dr. Barr * states that he has seen, felt, and heard asynchronous action of the ventricles. "Each side" (of the heart), he says, "has more or less independently its own nerve supply, its own peristaltic action and notwithstanding that both sides are set to the same time and that there is a complex interlacing of fibers, yet it is quite possible, nay, it is an experimented fact, that one side may begin or end contraction before the other." It therefore seems to me that Bramwell's opinion is correct. Both forms of reduplication are said to occur physiologically as temporary phœnomena owing to the effect of the respiratory movements on the circulation, especially when those movements are forcible. Reduplication of the first sound occurs at the end of expiration and beginning of inspiration, reduplication of the second sound at the opposite point of the circle, *i.e.*, at the end of inspiration and beginning of expiration. The physiological stimulus to contraction of the ventricles is recognized to be the distension of their cavities with blood. One ventricle may therefore contract before the other, according to Bramwell, when either the blood-pressure in the one is greater than in the other, or when the blood-pressure being the same, one ventricle is more irritable than the other, owing either to a relatively greater derangement of its nerve apparatus or to structural changes in its muscular wall. The lack of synchronism caused by the influences of respiration is due probably to the fact that at the

* Bramwell, Diseases of the Heart, 1st ed., p. 160, note.

end of expiration more blood is actually delivered to one ventricle than the other. Usually during tranquil respiration, the lack of synchronism, though probably present, is not sufficient to be appreciable.

In the case above cited of a patient with a dilated left ventricle, resulting possibly from heart-strain, the reduplication of the first sound was heard during tranquil respiration on two different occasions and was therefore probably not of the physiological type.* There existed manifest dilatation of the left, but not of the right ventricle. Now, the amount of blood delivered to each ventricle at a given cardiac contraction is about the same, the variations caused by respiration being probably unimportant so long as that act is tranquil. The undilated right ventricle would therefore be more distended than its dilated fellow by a given quantity of blood and would consequently contract sooner, thus giving rise to a reduplication of the first sound. The contraction of a weak ventricle is however less sustained than that of a normal one, so that, in spite of a later start, the left ventricular contraction might terminate synchronously with the right.

It must be borne clearly in mind that it is here a question of intra-ventricular pressure during ventricular *diastole*. In other pathological cases, as above stated, it may be a question of a disturbed balance of the relative irritability of the ventricles. Marked degeneration or nervous derangement may exist, but as long as both ventricles are equally affected no reduplication would be produced. Apart, however, from purely theoretical speculations which some unknown or unconsidered facts may entirely vitiate, persistent reduplication of the first sound has been found clinically associated with functional disorders of the heart and with grave organic changes of the cardiac muscles with or without valvular disease. It is at least within the limits of our present knowledge of the subject to say that its presence in a

* My recollection is that it was also continuous, *i.e.*, not depending on respiration, but my notes of the case are not specific on this point. Such reduplication would of course be entirely unphysiological.

given case is presumptive evidence of some cardiac lesion, the character and gravity of which must be determined by the other factors of the case.

In the case of the second sound, reduplication may be due either to derangements of the nerve apparatus or lesions of the muscular fiber of the heart, which cause the contraction of one ventricle to be shorter than that of the other, or to disturbances in the relative amount of resistance to be overcome by the respective ventricles. The semi-lunar valves must close the moment that the arterial tension is greater than the pressure from behind. Increased resistance, however, is met by increased vigor of contraction on the part of the ventricle upon which the strain comes. This increased vigor of contraction involves a lengthening of the ventricular systole. It is this increase which, according to some authorities, gives rise to the reduplication of the second sound

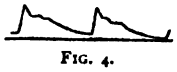

FIG. 4.

which is observed in a larger percentage of cases of mitral sterosis, the right ventricle in this case being called upon to make so prolonged an effort in the performance of its work that the closure of the pulmonary valve is later than that of the aortic. There are objections to this theory advanced by high authorities such as Guttmann and Sansom. My limited time will not permit me to consider these objections in this place. I must content myself with remarking that to me the objections offered seem to admit of plausible answers, but the alternative explanations seem improbable. The reduplicated second sound in the case of dilated heart in an anæmic boy above cited, was probably one in which the high tension of the greater circulation, shown by the sphygmograph, together with a factor to be mentioned later, caused a prolongation of the left ventricular systole, thus causing a reduplication in which the aortic element was the last. (Fig. 4).*

* In the interpretation of this tracing it is to be remembered that the patient was young (fourteen years) and his arteries therefore elastic. The rapid falling

When the peripheral resistance in both circulations is normal, reduplication of the second sound may be supposed to occur from unequal length of contraction in the ventricles, due to a preponderance of muscular degeneration or nervous derangement in one as compared to the other. Possibly the reduplicated second sound in the case of weak heart following pneumonia, cited above, was due to enduring predominant weakness of the right heart, upon which the greater strain comes in that disease. Its shorter contraction would, in that case, make the pulmonic the first element of the double sound.

It is theoretically conceivable that in mitral stenosis, for example, a time would arrive at which the ventricle upon which the extra strain was thrown would lose its power of prolonged contraction owing to advancing degeneration and that a reduplication, which was present earlier in the case, would disappear. This seems to me to be the answer to Guttmann's most formidable objection to the above accepted explanation of reduplication of the second sound in these cases, his objection being that the reduplication is often absent in the most marked examples of the lesion. Now it is in precisely those cases in which we would expect secondary failure of the right ventricle.

Again it is conceivable that an obstruction to either circulation which would not produce a sensible prolongation of the systole of the affected ventricle in health might have that effect when *both* ventricles were somewhat weakened. In such a case the contraction of the unobstructed ventricle would be shorter than normal. The systole of the affected side would be longer than that of the other, but still not so long as the contraction of a healthy organ would be in parallel circumstances, *i.e.*, when acting against an obstruction which bore the same proportion to its strength. These considerations may explain why, in the case of the anæmic boy, the increased arterial resistance was able to cause a percep-

off of the primary wave is the result of this factor. The high tension of the vessel is shown by the gradual descent of the pulse wave from the "tidal wave" onward.

tible reduplication of the second sound. In the case of weak heart resulting from the abuse of alcohol and general malnutrition, the cause being a general one, both ventricles may be supposed to have been equally affected. The absence of a reduplication of the second sound in this case may have depended on the low arterial tension.

Apart, however, from all theory, as a matter of clinical observation, reduplicated second sound is so frequently associated with obstructions to the greater or lesser circulations, with lesions of the cardiac muscle or with a combination of both, that its occurrence, as in the case of reduplication of the first sound, should lead to a careful study of the case with a view to determining the presence or absence of important cardiac disease. In my case of weak heart following pneumonia the reduplication of the second sound was heard, when last listened to, only at the end of inspiration and beginning of expiration, *i.e.*, it was of the normal type. The patient's condition at the time was comfortable, and an observer knowing nothing of his former history, might readily have concluded that the sign was without significance. The fact that he was still slightly short of breath on exertion, that his morbid symptoms had returned under strain on two or three occasions, and that the reduplication was heard during quiet respiration, go to prove that such a conclusion would be incorrect.

Weakness of the first sound of the heart, accepted generally as an indication of cardiac debility, was present in three out of the four cases. In the case of dilated heart in an anæmic boy, however, the first sound was sharp and ringing. Reference to the sphygmographic tracing (Fig. 4) shows that the condition of high arterial tension common in anæmia was present. Recalling the fact that during ventricular systole the cavity of the ventricle and the aorta are continuous and that vascular tension is produced by the *resistance* to the flow of blood, it is at once evident why a weak cardiac contraction may yet be accompanied by a loud cardiac sound. A striking feature, however, of cases II. and III. was that even when after treatment the ventricles were acting

fairly well, as indicated by the improvement in the symptoms of the patients, yet the first sound of the heart, though stronger than before, was still noticeably weak, and there was no extra-cardiac factor, such as thickness of the chest walls or emphysema of the lungs to explain that weakness. On referring to the sphygmograms (Figs. 2 and 3) the explanation is obvious. In both these cases persistent low mean arterial pressure was present, a condition due obviously to persistent dilatation of the small arteries. At the moment of the ventricular systole, therefore, the blood met with very little resistance on entering the aorta. Consequently the intra-cardiac pressure, and the reverberation of the valve thereon depending, remained below normal in spite of more vigorous contraction of the ventricles. It is obvious, therefore, that in interpreting the meaning of a short, weak, valvular first sound the peripheral resistance to the circulation is quite as important a factor as the strength of the ventricular contractions.*

Another striking point of contrast between these cases was that in the weak, irritable heart following the abuse of alcohol the second sound was loud and metallic, while that in the case of dilated heart, following muscular strain, was markedly weak. Referring again to the sphygmographic tracings, in the former it will be observed that the pulse wave is pointed, and the tension falls off without interruption (Figs. 1 and 2) showing a quick, sudden, ventricular contraction. The semilunar valves close, of course, at the moment that the pressure in the aorta becomes greater than that in the ventricle. In this case, from the form of the ventricular contraction, it seems obvious that the valves were closed by the full force of the retraction of the aorta unresisted by any pressure from behind. In the second case, however, (Fig. 3) the presence of the tidal wave and the higher position of

* I do not know that this condition of permanent relaxation of the peripheral arteries has been or can be regarded as a distinct pathological entity. I have somewhere seen the statement, though I have not been able to recall the reference, that persons in whom this condition exists show very little power of resistance when attacked by serious acute diseases.

the aortic noted in the tracing show that the ventricle contracted more gradually and that the aortic valves were probably closed in the face of a still advancing column of blood, their vibration being consequently weaker than in the former case. In interpreting, therefore, the meaning of a strong or a weak second sound, it is necessary to consider not only arterial tension but also the form of the ventricular contraction.

It must be remembered, however, as Cohnheim insists, that many degenerated hearts functionate in an absolutely normal manner so long as the demands upon them are within their ability to respond. In such cases diagnosis can be made only on such evidence of cardiac distress *under strain* as the history of the patients may furnish. I am convinced, however, that closer observation and analysis of the less striking evidences of deranged cardiac action would greatly lessen the number of cases of grave cardiac lesion which remain totally unsuspected during life, with which most physicians, who have opportunities for comparing their antemortem diagnosis with the revelations of the autopsy room, are probably only too familiar.

In conclusion I desire to say a few words about the contrasted action of the two cardiac tonics, digitalis and caffeine suggested by the above cases. According to the careful experiments of Riegel,* caffeine, like digitalis, slows the action of the heart and increases the amplitude and tension of the pulse both in health and disease. In cardiac failure, like digitalis, it renders the heart contractions more regular, increases the amount of urine and decreases the amount of albumin and the specific gravity. The slowing of the normal pulse by caffeine is spoken of as moderate. It differs from digitalis in its more rapid action and in the absence of accumulative effect. In some cases of failing heart caffeine was efficient after digitalis was found useless. In the above cited case of weak heart following pneumonia, digitalis, given in doses which are ordinarily efficient, produced little or no good effect, but improvement followed at once on using

* Berlin, Klin. Wochenschr, Vol. xxi., 1884, p. 289.

caffeine. In cases 2 and 3 marked improvement followed the use of digitalis. In the first case the sphygmographic tracing showed no abnormality of the pulse tracing. In the other two a permanent relaxation of the peripheral arteries was shown to exist. It is an old theoretical objection to digitalis that in a patient with degenerated heart the contraction of the peripheral arteries which it causes may more than offset its tonic effects on the cardiac muscle, the heart being unable to respond to the stimulus by virtue of its degeneration. Bramwell cautions against its use in fibroid heart on this ground. Trousseau* states that certain cases of dilated heart are made worse by it. It is suggestive that in the two cases cited above, that were benefited by digitalis, the tension of the pulse was only slightly increased by its administration. There seemed to exist a permanent dilatation of the peripheral arteries upon which digitalis produced little or no effect. In the case which was not benefited, as far as could be judged from a single tracing, arterial tension was normal. It seems plausible to suppose that the contrasted effects of the two remedies may lie in the slighter influence of the caffeine on the vaso-motor apparatus. This suggested explanation requires, of course, further study. The fact remains, nevertheless, that caffeine sometimes is efficient when digitalis fails. In Riegel's experience the contrary was the case in only a single instance, and in that the caffeine could not be tolerated on account of the gastric irritability and cerebral excitement which it caused. These symptoms are, however, not often produced. The greater safety and more rapid action of the drug point to it as preferable to digitalis as a cardiac tonic in heart failure occurring in acute diseases or primary degenerative processes of the cardiac muscle. The soluble and stable combination of the drug with salicylate or benzoate of soda are to be preferred to the insoluble and unstable so-called citrate, which has been long in use. It should be given in divided doses, at first small but pushed as high as two *grammes daily*, ac-

* Trousseau et Pidoux, Traite de Therap., 9th ed., T. ii., p. 1091.

cording to Dujardin-Beaumetz,* if smaller doses are not efficient.

In my narrative of cases and my comments, I have probably said little that is not already known to many of my hearers. I believe, however, that cases of the kind under discussion do not, in practice, receive the recognition which their frequency and importance deserve. It has *not* been my aim to treat my subject exhaustively, but to call attention to the fact that conclusions of the greatest practical importance can be arrived at, not by rule of thumb diagnosis, but by careful study of the symptoms and less striking physical signs present in *individual* obscure cases of weak heart.

* Bull. gén. de therap. '84, cvii., pp. 97–111.

CONTAGIOUS CONJUNCTIVITIS; ITS CAUSES, PREVENTION, AND TREATMENT.*

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THE literature of bacteriology fairly bubbles over with ingenious hypotheses; and yet the germ theory of disease is justly one of the chief principles of modern science, and substantial facts are steadily being brought forward to prove the influence of bacteria as morbific agents. It certainly is true that reports have reached us which would seem to negative the deductions from some of the experiments of prominent workers in this field of investigation; but there has been a great deal of hasty and groundless opposition to these researches. However, the inquiry into this matter is being vigorously pushed by skillful workers in the laboratories of Germany and France, and research of such vast importance to the whole human race deserves the greatest possible encouragement, and should not be regarded alone with the intellectual interest which theoretical inquiry excites.

The views which I shall have the privilege to lay before you this evening are the outcome of a practical inquiry into the cause and prevention of contagious conjunctivitis. I can only regret that the case of successful inoculation of a pure culture of the gonococcus which I made a short time

* Read before the New York Academy of Medicine, June 18, 1885.

since did not have for its field of operation a healthy human tissue; however, it is for others to decide whether the result obtained be of value or not.

In May, 1882,* Neisser declared that the gonococcus originally described by him in 1879 was the pathological principle of gonorrhœa; that it was the actual contagium of the gonorrhœal affection. That the presence of a micrococcus form is constant in the secretion of gonorrhœa has been confirmed by Bokai, Weiss, Aufrecht, Ehrlich, Brieger, Gaffky, Sattler, Leber, Haab, Hirschberg, Sternberg, and others; but all writers are not agreed that the micrococci they have seen in gonorrhœal pus were those occurring only in gonorrhœa, or the same which are found in all pus which has been exposed to the air, or that they differ in form and size or in other characteristics from the micrococci of other blennorrhœas. Neisser maintains that the "gonococcus" is a specific kind of coccus, which is not alone functionally but morphologically characteristic.

According to its discoverer (Neisser), the gonococcus is comparatively large, flattened on the side which is turned toward its neighbor, somewhat oval, seldom single, almost throughout double. It lies close to its neighbor with only a fine fissure between the two; in shape it is "*semmelförmig*." It multiplies by division transversely, forming a pair, these dividing at right angles to the first line of division, thus forming a group of four; they never occur in the chain-form; they are found free in the fluid, or more frequently adherent to the pus-corpuscle and epithelium. The arrangement in groups of two and four is constant in gonorrhœal pus, and, although this grouping is sometimes seen in specimens of pus from other sources, the chain-form is the more common in them. Bockhart found the gonococcus group mostly on the pus-cells or their nuclei, never in their interior; Haab, on the contrary, found them within the nuclei.

Eklund† denies that the gonococcus is alone specific for

* "Deutsche med. Wochenschrift," No. 20, 1882, p. 279.

† F. Eklund, "Note sur les microbes de la blennorrhagie," cited in Schmidt's "Jahrbücher," Bd. cxcvii., 1883, p. 139.

gonorrhœa, because he professes to have found similar organisms in acute and chronic purulent processes in the lungs and intestines, in ulcerative stomatitis, etc. But the bacterium of gonorrhœa seems to possess an ability which all forms which resemble it do not—viz., that of penetrating into the living cell protoplasm and of multiplying in it; but this power is soon exhausted.

In the normal human saliva there are micrococci which resemble those of gonorrhœal pus; but, if there is a morphological resemblance, their functional characteristics are, at least, not the same as those of the gonococci. There is a short, thick bacterium in the vaginal secretion, swelled by coloring agents and looking like a diplococcus. Bumm and Bockhart profess to have found the "semmelförmig" diplococcus in the secretion of the female genitals, in diphtheritic sores, in ulcerative process in the mouth, and in a preparation of the sputum of a patient with whooping-cough. Welander * found Neisser's gonococcus in all cases in which he looked for it—among 129 cases of acute and 15 cases of chronic urethral blennorrhœa; even cases of eight to sixteen months' duration were not excepted.

Neisser twice saw profuse purulent discharge from the urethra of a man which occurred after very frequent catheterization preparatory to lithotrity. The secretion contained abundant evidence of the presence of bacteria, but no gonococci were found.

In my case of successful inoculation of a pure cultivation of gonococcus I proceeded in the following manner: The cultivation medium was serum of the blood of the ox, prepared according to Koch's directions, being heated daily one hour, for six successive days, to 58° C., and thus sterilized and gelatinized by subjecting the serum to a temperature of 65° C. A small quantity of fresh pus from a case of acute urethral gonorrhœa was allowed to drop from the urethra on to the sterilized platinum-wire, and then to drop off the latter, leaving only a thin layer of pus on the wire;

* Reviewed in "Vierteljahresschrift f. Dermatologie u. Syphilis," 1884, p. 178.

the wire, thus charged, was thrust into the firm blood-serum in three or four different places, and the test-tube closed with sterilized cotton-wool; a number of test tubes were thus planted and placed at once in the incubator, the temperature of which was maintained in different cultivations at 32°–36° C. After about twenty-four hours, further inoculations were made from the first tubes. With the seventh generation I inoculated a human conjunctiva. The case was one of granular conjunctivitis *in stadio cicatricio* and with dense pannus, but without purulent secretion or any discoverable cocci in the conjunctival secretion. The choice of treatment lay between the use of jequirity and inoculation with gonorrhœal pus. Nothing was concealed from the patient, and he sanctioned the inoculation with full knowledge of what the consequences might be. I had unsuccessfully inoculated so many different animals with cultures of the gonococcus that I hailed with extreme delight this opportunity to make the trial in the case of a human being. Three weeks previous to this operation I had inoculated the same eye with a pure cultivation of the coccus taken from my own saliva, the result having been negative. I prepared the conjunctiva for the reception of the pure cultivation of the gonococcus by washing the conjunctival surface for several days with *pure water*. I then conveyed the cultivation to the conjunctival sac and bound up the eye with a roller bandage and absorbent cotton-wool, due attention having been given to the condition of these things. The result was a perfect picture of gonorrhœal conjunctivitis with abundant evidences of the presence of the gonococcus.

Bockhart * obtained a successful inoculation, from a pure cultivation (gelatin) of the *fourth generation* of the gonococcus, on the sound human urethral mucous membrane. The subject of the experiment was a forty-six-year-old paralytic whose death was expected daily. On the sixth day a typical gonorrhœa was formed, which increased in severity up to

* "Beitrag zur Aetiologie und Pathologie des Harntrippers:" "Vierteljahresschrift f. Dermatologie u. Syphilis," 1883, Heft i., p. 8.

the twelfth day, when the patient died. The characteristic gonococci were found in the secretion.

Sternberg's criticism on this case is, that the fourth successive cultivation is not sufficient to insure the exclusion of the original material—"a hypothetical non-living virus"—"when the cultivation is conducted upon a solid substratum."

Sternberg did not succeed in producing urethral gonorrhœa in himself and two others with a pure culture of the gonococcus.

Loeffler and Leistikow * had negative results after inoculation of apes, dogs, and rabbits with a pure growth of the gonococcus.

Krause † cultivated the cocci from ophthalmia neonati on blood-serum, and with the pure cultivation inoculated the cornea, conjunctival sac, and urethra of full-grown rabbits, and adopted the same procedure in the case of young cats, pigeons, and mice; but these experiments as well as subcutaneous inoculation of rabbits and mice, were without result. Krause then inoculated the conjunctival sac of newborn rabbits (six to ten days old) with the same cultivation (from ophthalmia neonati), and produced a purulent conjunctivitis, which was present twenty-four hours after the transfer, and in the course of the following days became more intense. Three of the rabbits died, on the fifth and seventh days after the inoculation, from other causes; one animal lived for some time; in this one, on the tenth day there had developed a very profuse purulent discharge from the conjunctiva; the pus had the ordinary cheesy character of rabbit's pus, and contained, in addition to bacterial contaminations, numerous cocci which were somewhat smaller than those of Neisser. On the following day there was an abscess of the cornea, which perforated the latter. Krause does not assert that this result should be accepted as conclusive. He maintains that in this case Neisser's gonococcus was the active agent in the infection.

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* "Verhandlungen der Gesellschaft der Charité-Aerzte zu Berlin," Sitzung vom 16 Februar, 1882.

† "Centralblatt f. prakt. Augenheilk.," May, 1882, p. 137.

The successful inoculation of the urethras of three medical students with gonococci cultivated by Bokai can not be accepted as conclusive, because of the manner in which the cultivation was conducted.

It appears that animals are not susceptible to the poison of gonorrhœal pus, neither the cocci nor the pus itself being capable of reproducing the disease in them.

What interests us most is whether the gonococcus is the cause of gonorrhœa in the human subject; and when the objection, that the essential agent in the infection is a soluble unorganized substance contained in the pus used for inoculation of the cultivation medium, has been removed by isolation of the coccus, and the disease is induced with it alone, then we have very strong facts to argue from.

ÆTIOLOGY OF OPHTHALMIA NEONATI.—According to von Graefe, all inflammations of the conjunctiva are contagious through the secretion which they furnish—contagious in the sense that this secretion must be conveyed to the conjunctival sac of a healthy eye. The more intense the swelling and discharge from the original diseased mucous membrane, and the more acute the inflammation of the latter at the time of the conveyance, the more active will be the poison. The hypothesis of contagion through the air was admitted by von Graefe, and is still held by some excellent observers; but infection through this source, I feel sure, is quite rare, and, when there seems to be no other source than the atmosphere to fall back upon in a given case of contagious eye-disease, we should still refer to the atmosphere as a probable source of infection with misgivings.

The chief cause of ophthalmia neonati is infection derived from the genitals of the mother, either at the time of birth of the child or a short time afterward, the poison in the latter instance being transferred to the child—healthy at birth—through the medium of the bath-water, but much more probably through sponges, towels, etc.

Credé maintains that a *pure catarrhal secretion* of the genitals does not produce blennorrhœa, but Haussmann *

* "Archiv f. Gynäkologie," 1881, Bd. xxi., p. 523.

says that the vaginal secretion may be infectious. Zweifel * inoculated normal lochial secretion upon the conjunctiva of the new-born in six cases without producing blennorrhœa even once. I inoculated normal lochial secretion upon the conjunctiva of the new-born in three instances, the result being negative. In spite of these facts, it has been maintained that the normal lochia does give rise to conjunctival blennorrhœa. But there is no positive proof that this is anything more than a mere assertion.

We know that gonorrhœal pus, placed in a healthy human conjunctival sac, gives rise to the same disease with the precision of a physical experiment; therefore the view that normal lochial secretion produces conjunctival blennorrhœa in one person and not in another seems, according to this reasoning, to be untenable.

I believe that the infection occurs some time after the birth of the child much more frequently than is generally supposed, the original source of the infection being the same as in the first instance; and from this original cause many other eyes may be infected by direct conveyance of the poison to them by the mother or nurse. I could cite many instances in my own experience to support this statement. The cases of purulent conjunctivitis which occurred in my service at the Nursery and Child's Hospital (Country Branch) in 1879 originated in this way.

At the Foundling Hospital in St. Petersburg during six years 2,918 cases of ophthalmia neonatorum were observed, and simultaneously 345 wet-nurses of the children were attacked with the same disease.†

Theremin ‡ has recorded a table from the same institution embracing six subsequent years, according to which 476 cases of "blepharo-blenorrhœa" occurred, and the relative frequency of the disease at and after birth is indicated as fol-

* "Archiv f. Gynäkol.," Bd. xxii., p. 329; see, also, his recent communication on these cases, same Archives, Bd. xxiii., p. 325.

† Froebelius, "Medicinische Zeitung Russlands," 1885, Bd. xii., No. 33, p. 257; cited by Haussmann.

‡ "St. Petersburger med. Zeitschrift," Bd. v., p. 97; cited by Haussmann.

lows: On the first to the fourth day, fifty-seven cases; from the fourth to the eighth day, one hundred and thirty-four cases; from the eighth to the fourteenth day, ninety-four cases; later, one hundred and ninety-one cases. Olshausen thinks that when the disease occurs after the fourth day the child was infected after birth. Although ophthalmia is infrequent among the better class of patients, it is quite common among the ignorant poor, and the homes of such people are constantly menaced by the danger of a child at the breast, already a victim of the disease in question, infecting the whole family. Haussmann thinks that the purulent secretion from a sore nipple may become a source of infection.

The question has been freely discussed as to whether Neisser's gonococcus is the special bacterium of this disease. Whoever may be interested in reading over the contradictory views on this subject will find an abundance of material in Haussmann's work, "Die Bindehautaffection der Neugeborenen," Stuttgart, 1882. Leopold and Wessel* tell us that, of eighteen mothers whose children were not placed under prophylactic treatment, gonococci were found only in the case of one mother, and, on the third day after the birth of her child, the latter presented the familiar appearances of conjunctival blenorrhœa. No gonococci could be found among the remaining seventeen women, and their children remained free from any inflammation of the eyes. Their article contains many instructive details which it would be quite impracticable to incorporate in the present paper, which has already assumed proportions much greater than I had originally prescribed for it.

Haussmann† cites the statistics of Cederskjöld, of Stockholm, according to whom the eyes of the children of mothers with blennorrhœa were diseased in 14.6 per cent., and of the children of mothers free from blenorrhœa only 5.52 per cent. were affected. But the 5.52 per cent., were they not infected by the others?

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* "Archiv f. Gynäkol," 1884, Bd. xxiv., p. 93.

† "Die Bindehautaffection der Neugeborenen," Stuttgart, 1882, p. 22.

GRANULAR CONJUNCTIVITIS.—At the Ophthalmic Congress in Heidelberg, in 1881, Prof. Sattler announced that he had succeeded in finding in the conjunctiva of granular conjunctivitis micrococci which resembled those of Neisser, and that with a pure cultivation of those cocci he had reproduced the disease in question in a man. Leber confirms Sattler's statement as to the finding of cocci in the tissue of granular conjunctivitis. About thirty years ago Arlt* taught that there was an intimate relationship between granular conjunctivitis and struma, also tuberculosis. This view has been pretty generally abandoned by ophthalmologists of the present time, and Sattler's discovery might dispose us still further to differ with Arlt, but it is very probable that Sattler is in error in this matter. I have searched in vain for any micrococcus form in the tissue of granular conjunctivitis. In a paper published last year† I gave the details of the manner in which I had proceeded in investigating this question. I had examined 1,500 sections taken from 37 cases of trachoma without being able to find any cocci in them. I have since carefully examined five cases of this disease, with the same end in view, but, although I have applied the proper staining agents and the other indispensable aids in such examinations—*i. e.*, Abbe's condenser and the homogeneous immersion of Zeiss—I have never succeeded in finding any cocci in these tissues, except in cases of trachoma accompanied by an active catarrhal process. But cocci are found in the secretion of granular conjunctivitis, and the disease is unquestionably contagious, and the secretion is the carrier of this contagion; but there is this peculiarity about the disease, that it requires that certain constitutional conditions shall obtain in order that the disease may be reproduced in another to whose eye the secretion has been transferred. It is a clinical fact that struma and trachoma generally go hand in hand, and *overcrowding, filth, and poor food* are the essential factors in the production of this terrible disease.

* "Die Krankheiten des Auges," Prag, 1858, i., pp. 130, 131.

† "Archives of Medicine," vol. xi., June, 1884, p. 221.

DIPHTHERITIC CONJUNCTIVITIS. — Fortunately for us, diphtheritic conjunctivitis is a rare disease in this country. Its mode of origin and course harmonize thoroughly with the doctrine of its dependence upon pathogenic micro-organisms. Its contagiousness is undisputed, and the germ theory affords the best explanation of its phenomena; and yet, in spite of many elaborate researches, the precise nature of the diptheritic virus is still a matter of doubt. The majority of those who have studied the question from the pathological and experimental side declare in favor of a specific micrococcus which is found imbedded not only in the membranous deposit, but also in the lymphatic spaces, beneath the mucous membrane, in the blood, and in the internal organs—Oertel, Eberth, and Klebs. Loeffler* details an extensive experimental inquiry upon diphtheria in animals and man. He confirms the fact that micrococci prevail in diphtheritic membrane mingled with other forms of bacterial life, which find a suitable nidus in the necrosed and decomposing tissue; but he lays special stress, from the ætiological point of view, upon the presence of a bacillus first made known by Klebs. This organism invariably occurs in association with the micrococci, but presents, far more than these do, the attributes of a specific virus.

The micro-organism which Emmerich † alleges to be distinctive occurs in the diphtheritic lesions both of the pigeon and of man, is neither a coccus nor a bacillus, but a short, thick bacterium, which, in gelatin cultivations, forms a pellucid, grayish color, assuming a whitish appearance as it develops, and not liquefying the gelatin. It grows luxuriantly on the potato, forming on it a thick yellowish-white layer, but in blood-serum the bacterium does not grow well. In form, size and mode of growth the diphtherial bacterium of man is identical with that of the pigeon. Inoculations were successfully made with this organism. But very great difference of opinion prevails among bacteriologists them-

* Friederich Loeffler, "Mittheilungen aus dem kaiserlichen Gesundheitsamte," Bd. ii., 1884, p. 421.

† R. Emmerich, "Deut. med. Wochenschrift," 1884, No. 38, p. 614.

selves as to the morphology of the diphtherial fungus. Emmerich thinks diphtheria is essentially a *house-disease*, prevailing in those seasons in which dwellings are most likely to be overcrowded.

PROPHYLAXIS OF OPHTHALMIA NEONATI.—Starting from the proposition that the infection of this disease is derived, in the first instance, from a pathological vaginal secretion from the mother, thorough and judicious cleansing of the diseased vagina should be practiced before the birth of the child, and, when the child of such an infected mother is born, its eyes should be washed with a saturated solution of boric acid, and a two-per-cent. solution of nitrate of silver be dropped into the conjunctival sac; and the child and mother should not alone be kept from other children, but the mother should be told of the contagious character of her disease, and warned against using towels, sponges, or cloths that have been used on her own person, for wiping her child.

The eye-trouble begins about the second or third day after birth, also sooner or later; the sooner, the more intense it will be, generally.

Credé first tried thorough cleansing of the diseased vagina of the mother before the birth of her child. The number of cases of eye-trouble was diminished thereby, but it did not disappear. Then he began to disinfect the eyes of the children, and the results were more favorable. This is quite natural, because, if the child is infected at the time of its birth, no amount of attention bestowed upon the mother would affect the child so long as it was neglected. At first Credé proceeded as follows:—In all cases of gonorrhœa or chronic vaginal catarrh in the hospital, the vagina was frequently washed with lukewarm water, or a solution of carbolic acid, or salicylic acid, two per cent.; near term this was done every half-hour. The eye-trouble was less frequent, but it was not stamped out. In 1879 he made the first trial of prophylactic instillations into the eyes of the new-born immediately after birth, and used a solution of borax (1 to 60) without satisfactory results.* Then he tried

* "Archiv f. Gynäkol.," 1881, Bd. xvii., p. 52.

a solution of nitrate of silver (1 to 40), which was dropped into the eyes soon after birth. These instillations were preceded by careful washing of the eyes with a solution of salicylic acid (two per cent.). Children thus treated remained free from eye-trouble. From June 1, 1880, all eyes, without exception, were, immediately after birth, first washed with plain water and disinfected with a solution of silver nitrate (two per cent.), a single drop being placed in each eye; then the eyes were cooled with pledgets of linen wet in a solution of salicylic acid (two per cent.). The vaginal douching was, on the contrary, discontinued. Only one child on the sixth day, had a mild conjunctivis of the left eye, without swelling of the eyelids, and was cured in three days. It was shown in this case that in the hurry the prophylactic instillations had not been made. Sometimes a slight hyperæmia followed these instillations, and now and then there was a slightly increased secretion in first twenty-four hours; these appearances do not persist after the first day. Previous to the introduction of this treatment in Credé's clinic at Leipsic ten per cent. of the children born there had eye-trouble: since its employment, from June 1, 1880, till March, 1883, the percentage was reduced at once:

1880 (7 months),	211	children,	1 case;
1881	400	"	1 "
1882	418	"	2 cases;
1883	131	"	No case.
	1,160		

The patient in 1880 was not disinfected. The mother, in one of the two cases which occurred in 1882, had syphilis and gonorrhœa, and what is of interest to us to remember in this connection is that, in spite of the instillation of silver nitrate (two per cent.) immediately after birth, it was too late. Credé says that the other case (1882) resembled one of catarrhal conjunctivitis.

Abegg* washed the eyes with pure water immediately

* H. Abegg, "Archi. f. Gynäkol.," 1881, Bd. xvii., p. 503.

after birth. The result was that among 2,266 births there were 66 cases of ophthalmia neonatorum, or about three per cent.

At the suggestion of Alfred Graefe, Olshausen * used a one-per-cent. solution of silver nitrate, without previously washing the eyes, and reduced the percentage of ophthalmia neonati from 12.5 to 6 per cent.; but he observes that *the percentage would have been even smaller had the measures been more exactly practiced from the beginning.*

Hecker (München) used a one-per-cent. solution of silver nitrate as a prophylactic, but he had about as many cases as before, and Credé's criticism upon these results is that one per cent. is not sufficiently strong.

In Maternity Hospital, Blackwell's Island, New York, Dr. Garrigues applied a two-per-cent. solution of silver nitrate to the eyes of all the children born during his service at that institution from October 1, 1882, to March, 1883, and from October 1, 1883, till March 31, 1884, during which time 351 children were born, but not a single case of eye-trouble occurred among those children. Dr. Garrigues does not state whether any of the mothers were infected or not. At the same hospital, in Dr. Mundé's service, the house surgeon, Dr. B. Hughes Wells, informs me that between April 1 and May 15, 1885, 83 children were born, all of whom were treated with silver nitrate (two-per-cent. solution), there being not a single case of eye-trouble. In the six weeks preceding Dr. Mundé's service (Dr. Murray's service) 58 children were born. In this instance a one-per-cent. solution of silver nitrate was used, and there were more than 10 or 12 cases of ophthalmia neonati, but none of these cases led to loss of sight; only in one case was there ulceration of the cornea, and in this the latter was not perforated.

Horner † indorses Credé's treatment with silver as the most effective. In the discussion on Dr. Horner's paper, the expediency of employing this treatment in private practice was questioned. It was said that the eversion of the

* R. Olshausen, Centralblatt f. Gynäkologie, 1881. No. 2, p. 33.

† Correspondenzblatt der schweizer Aerzte, 1882, No. 7.

lids should not be intrusted to a midwife, because she might drop the solution on the cornea and damage it. Credé replied that he never everted the lids, because he deemed this superfluous; he dropped the silver solution (two per cent.) on the cornea without having seen a single case in which this cauterized the cornea.

Königstein* observed, among 1,092 children in Späth's clinic for whom no prophylactic measures had been adopted, blennorrhœa in 4.76 per cent.; catarrh in 14.5 per cent. He adopted Olshausen's plan of washing the eyes frequently with a solution of carbolic acid, one per cent. Of those thus treated, two per cent. had blennorrhœa and six per cent. catarrh. Finally, of 1,300 children treated according to Credé's method, one half per cent. had blennorrhœa and six per cent. catarrh.

Felsenreich, in the clinics of Carl and Gustav Braun, reduced the percentage of blennorrhœa by Credé's treatment from 3.34 to 1.93 per cent.

In 1881, Bayer† treated 361 children at the Stuttgart Lying-in Hospital according to Credé's plan, and there was not a single instance of eye-trouble; while in 1880, among 354 children born at the same institution, there were 34 cases, and in 1879, among 351 children, there were 51 cases of ophthalmia neonati, no prophylactic treatment having been then employed.

At the Royal Lying-in Institute in Dresden, Credé's treatment was introduced on October 1, 1883.‡ The instillations were made about a quarter of an hour after birth, after the child had been washed and its eyes cleansed with a piece of linen dipped in fresh water. In a few cases, in the confusion occasioned by many births occurring in quick succession, the instillations were made somewhat later. From October 1, 1883, to July 10, 1884, 1,002 live children were born. Uncleanliness, intense elytritis, and granular elytritis were present in numerous instances, and other in-

* Wiener med. Presse, 1882, No. 24.

† Centralblatt f. Gynäkol., 1882, p. 515.

‡ Leopold and Wessel, Archiv f. Gynäkol., 1884, Bd. xxiv., p. 89.

fluences were also noted which might have contributed to favor a blennorrhœal infection in the children, but not a single case of blennorrhœal conjunctivitis occurred.

Credé's treatment, with its instillations of a two-per-cent. solution of silver nitrate, and especially the additional applications for twenty-four hours of a solution of salicylic acid (two per cent.) on pledgets of linen, involves a strict personal supervision which must be counted. But the evidence, taken all in all, certainly proves the value of a two-per-cent. solution of silver nitrate as a prophylactic in ophthalmia neonatorum; yet it should not be used to the exclusion of scrupulous cleanliness.

In order to guard against post-natal infection—which, as I have said, I believe to be more common than that at the time of birth—children should be kept in their cots and not given to the mother (if she is infected) except at the time of nursing, and then all the precautions respecting the use of sponges, towels, etc., should be kept in mind.

If it is possible, by the means indicated, to cut down the percentage of cases of ophthalmia neonati so impressively as the statistics cited above would seem to prove that we can, it is quite impossible to exaggerate in words the importance of the gain.

Horner has shown that, among 100 blind asylums of Germany and Austria, between 33 per cent., or, to be more exact, between 20 per cent. and 79 per cent. of the blind children had lost their sight from ophthalmia neonati.

In a statistical report submitted to the Blind Congress in Paris, in 1879, F. Daumas declared that, of 56,391 eye-patients treated by himself, 1,178 had become incurably blind, 108 cases of blindness being due to incurable disease and 1,070 to curable disease.

In the United States, ophthalmia neonati causes blindness in numbers exceeding 32 per cent. of the cases of preventable diseases of the eye.

Now, inasmuch as blindness from the disease under consideration occurs mainly among the poor, and is due chiefly to ignorance regarding its dangerous character and the con-

sequent neglect to apply prompt and effective medical aid, it behooves the profession to draw general attention, and especially that of midwives, to this very important subject. Our general dispensaries might substantially aid the dissemination of this desired intelligence by having conspicuously printed on the card presented to every female patient who applies for medical aid the following INSTRUCTIONS REGARDING NEW-BORN INFANTS:

"*If the child's eyes become* RED *and* MATTER *begins to* RUN *from them, at any time after birth, take the child at once to a doctor.* THE DISEASE IS VERY DANGEROUS, AND, IF NOT TREATED AT ONCE, IT MAY DESTROY THE SIGHT OF BOTH EYES."

Let me now give you an outline picture of purulent conjunctivitis as it is but too frequently seen at our eye-infirmaries. The mother takes her child to the infirmary with the statement that the child's eyes had "run matter" for some days; but the eyelids had become so red and swollen, and the child so restless, that she thought she had better take it to the hospital. We examine the eyes and find a large slough of one or both corneæ, and the sight of one or both eyes destroyed. Every eye-surgeon has seen many such cases. Could a stronger reason be given for the urgency of sending out words of warning to these unfortunate people? A mother would not neglect early attention to her child with this disease if she knew how terrible the consequences would be of so doing. The next question is, How shall we treat such cases? To return such a child to its own home would be to expose the rest of the family to the disease; and, again, such patients are brought to us at the infirmaries three times weekly; they then return daily to their homes, where the ignorance of the simplest rudiments of personal and domestic hygiene which invariably prevails there must necessarily neutralize whatever good they may have received at the hospital. Indeed, patients with this disease require to be under skilled and constant surveillance; and, if our eye infirmaries will not receive these cases because of the danger of infecting their other patients, the exigencies of the case

are best met by the establishing of a separate hospital for the treatment of contagious ophthalmia.

In Great Britain steps were taken last year in the direction of making efforts to prevent the terrible consequences of ophthalmia in the new-born, and it is hoped that the committee appointed for the same purpose at the last meeting of this Academy will succeed better than our colleagues across the Atlantic in carrying out the plans they may agree upon to meet the end in view.

TREATMENT.—The attendant's hands and nails must be thoroughly cleansed and his or her eyes protected with *protective spectacles.* If one eye only is affected, its fellow should be sealed with cotton-wool, covered with adhesive plaster, and over this a solution of rubber should be painted, so as to exclude any discharge which may run over the bridge of the nose from the affected eye, and, in the case of infants, the hands should be secured, in order to keep them from the eyes. In the case of adults, a far better protective covering for the healthy eye is one recommended by Dr. Buller, of Montreal, which consists of a piece of mackintosh, about four inches and a half square, with a watch-glass (old-fashioned, deep glass) fastened to a hole in the centre through which the patient can see; the whole is then fixed by broad pieces of strapping to the nose, forehead, and cheek, its lower and outer angle being left open for ventilation. In case of redness or swelling of the conjunctiva, this covering must be discontinued and the conjunctiva painted, as a preventive, with a two-per-cent. solution of silver nitrate, followed by cold applications.

So long as there are increasing redness and swelling of the eyelids, together with rising temperature of these parts, and a watery or sticky, transparent secretion, which shows that we have to do with a pure inflammation, the treatment must be anti-inflammatory, directed to the contraction of the paralytic vessels, and thereby diminish the filtration and diapedesis; and the remedy is the same in the case of the eye as in other parts of the body. The ice-cloths should be applied, and, according to the height of the local tem-

perature, their use should be more or less vigorous; but *under all circumstances, the cold applications must be diligently changed*, in order that the action of the cold may be as nearly as possible equable. When the local heat is very great, the cold must be maintained day and night.

When purulent conjunctivitis is fairly established, the indications for treatment are: 1, to wash away the infective material as thoroughly and as early as possible; 2, to render the conjunctival surface as nearly as possible aseptic. It is impossible to exaggerate the importance of securing a perfect fulfillment of the first of these conditions. If the disease is seen at the very onset, and the eye cleansed at once, its course will be less violent than where this is not done. This washing may be done with a saturated solution of boric acid, or a two-per-cent. solution of carbolic acid, the latter to be weaker as the discharge grows less. The eye must, of course, be carefully examined for any change in the cornea. It is not necessary that we should employ our solution in sufficient strength to be germicidal. The ordinary method adopted in purulent conjunctivitis of washing the eye with a so-called antiseptic fluid does not kill the bacteria in the secretion, but removes the contagious principle as completely as may be, or so dilutes it that it can do harm only in a less degree; and it will be found that the secretion actually decreases in proportion to the disappearance of the cocci from it. I think that for this reason the irrigation should be maintained for several minutes at a time—ten to fifteen minutes. I would then paint the conjunctival surfaces of the upper and lower lid with a two-per-cent. solution of silver nitrate, or even twelve per cent. if the conjunctiva is much swelled; and, in case the latter strength is used, wash afterward with a solution of sodium chloride. The strength of the silver solution is to be regulated by the succulence and vascularity of the conjunctiva—the more pronounced these conditions, the stronger should the solution be. This having been done, *cover the conjunctiva with an antiseptic dressing consisting of boric acid* (*six per cent.*) *or carbolic acid* (*two per cent.*) *and vaseline*. The

vaseline will be retained much longer than a watery solution would be. This dressing will, in a great measure, have the power (without injury to the cornea) of arresting the vital activity of the bacteria, of starving them out, as it were, by so changing the nutritive pabulum required for their development that they can not appropriate it to their use. The irrigation will have to be repeated as often as may be indicated by the quantity and quality of the discharge. If there is much swelling of the eyelids, the outer canthus should be cut. The application of cold should not be made with ice-bags. Pledgets of linen—to be burned after use—should be laid on a piece of ice at the bedside, and this application of cold requires care and a constant attendant.

In the severe forms of gonorrhœal conjunctivitis—and this disease is nearly always very severe—when not seen very early and treated at once, the cornea runs great risk. The eyelids are intensely swollen, and when the ocular conjunctiva is much infiltrated the cornea is in great danger of suppuration, and the treatment should be directed to the reduction of the pressure on the eyeball and diminution of the secretion already formed. The pressure caused by the chemosis and swollen lids compresses the vessels which supply the margin of the cornea, causing an insufficient circulation. In order to remove this factor, the outer commissure should be divided to its fullest extent, together with the canthal ligament. The late Mr. Critchett, of London, proposed to divide the upper lid vertically to the orbital margin in severe cases, evert the flap and fix it to the skin above, and he says the cornea does not suppurate when this is done. Fuchs * has modified this operation. He divides the outer commissure to such an extent as to relieve also the symptoms of pressure. He then puts a suture through the lower lid and attaches it on the cheek, ectropionizing it entirely. He detached the suture, in the case he reports, at the end of the fifth day, and the healing was good. If the cornea is involved, it requires special attention in addition to the use of atropine. A thorough removal of the

* Centralblatt f. prakt. Augenheilkunde, 1881, p. 198.

secretion from the upper *cul-de-sac* is not possible by the ordinary means; this may, however, be done by means of a simple instrument which I have devised for the purpose. The instrument is an eye-speculum, the arms of which are hollow and the claw deeper than in the ordinary eye-speculum; it has a number of perforations for the passage of the fluid, which is supplied by a fountain syringe. It is inserted between the lids with great gentleness, and care should be

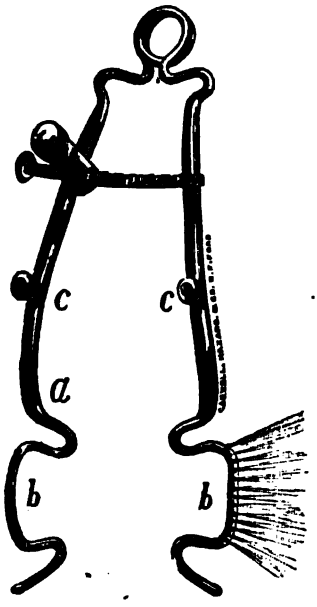

FIG 1.

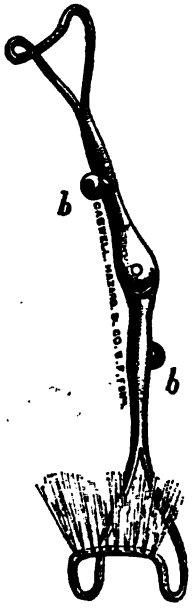

FIG. 2.

The instrument shown in Fig. 1 may be used for either eye, the tube with the water-supply being attached at c, and to the upper branch only in case it is desired to irrigate the upper *cul-de-sac* alone. Fig. 2 represents a folding lid-elevator (of large and small size) designed for the same purpose as the spring-speculum. The tube of the fountain syringe is attached at *b*.

taken not to injure the cornea with it. The lids should be gently lifted from the eye-ball by means of the speculum, and the spray of fluid allowed to play upon the upper *cul-de-sac*. Even when the lids are extremely painful, it is a relief to have them gently lifted from the eyeball and the

stream of fluid allowed to play upon the upper conjunctival *cul-de-sac.*

Of course the use of this instrument should not be intrusted to an ordinary nurse, but the physician can at least perform the operation twice daily, and keep up the irrigation for from ten to fifteen minutes. The solution of carbolic acid in the case of adults, when the inflammation is intense, may be as strong as three per cent.—to be diluted as the disease improves; this is astringent as well as antiseptic. And the silver I would apply, according to an exigency of the case, in four-per-cent. or twelve-per-cent. solutions, and neutralize with salt and water, and then apply the medicated vaseline to the conjunctiva, and over the lids the iced cloths. Iodoform has not met with much favor in this disease. Quinine in solution has also been used, but it has no advantage over the carbolic acid. Dr. H. Linds Ferguson (Dublin) reports cases of gonorrhœal conjunctivitis in which he has had good results from the use of finely powdered boric acid. The bichloride of mercury has no claim to advantage over the boric acid.

DIPHTHERITIC CONJUNCTIVITIS.—Measures of prophylaxis based upon bacteriology must lie in the future. We must be content with the enforcement of general hygienic laws. Mr. Tweedy * used one-per-cent. solutions of quinine in this disease, and did not see any serious damage to the cornea when it was used. Iodoform does not seem to be of much use in diphtheritic conjunctivitis. Vossius † recommends a four-per-cent. solution of salicylic acid in glycerin.

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* London Lancet, 1882, No. 1.

† Klin. Monatsbl. f. Augenheilk., Bd. xix., p. 423.

ORIGINAL DEDUCTIONS BASED ON A STUDY OF ONE HUNDRED CASES OF FRACTURES OF THE UPPER EXTREMITIES EXCLUDING THE HAND.*

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In presenting my paper, entitled "Original Deductions based on a Study of One Hundred Cases of Fractures of the Upper Extremities, excluding the Hand," I claim no originality in my general plan of treatment of these cases except in the use of splints which I have invented, and which have, to my knowledge, never been used before. If, in the history of each case coming under my care during the past four years, I present any idea that may hereafter prove a new and substantial benefit to even one unfortunate laborer by shortening the term of enforced idleness resulting from accidental injury, and by bringing him or her out of such term with a useful instead of a crippled arm or joint, I shall consider my time well spent in reviewing my experiences in this line.

That fractures of the upper extremities are very common among children, as well as among older persons, is shown by the following tabulated list:

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* Read before the New York Academy of Medicine, December 3, 1885.

	6 years and under.	6 to 12 years.	12 to 50 years.	Over 50 years.	Total.
Scapula (3)—Acromion	....	....	2	....	2
Coracoid process	....	....	....	1	1
Clavicle (37)	20	5	8	4	37
Humerus (15)—Surgical neck	....	1	....	....	1
Shaft of	2	....	....	1	3
Condyles: T-fractures	....	1	1	....	2
Internal condyle	1	2	....	....	3
External condyle	1	2	1	....	4
Epicondyle	...	1	1	....	2
Ulna (11)—Olecranon	....	....	3	....	3
Shaft	....	....	1	1	2
Head of	....	....	4	....	4
Styloid process	....	....	....	2	2
Radius (34)—Neck of	....	1	....	....	1
Shaft of	4	....	2	....	6
Lower end of Transverse or short oblique	1	....	9	2	12
Lower end of Colles'	....	....	3	12	15
Total	29	13	35	23	100

Hence it becomes us as surgeons to employ our art in assisting nature's physiological laws of repair by placing the fragments in such a position as will most likely result in a complete union without deformity, and that such a position shall allow as much ease and comfort to the sufferer as possible. This has been my constant desire and aim, both in dispensary and private practice. The above table shows that nearly half of these fractures occurred to children under twelve years of age. Of these, twenty-five were fractures of the clavicle; eight were fractures of the condyles of the humerus, and but one a fracture of the lower end of the radius. In the cases over twelve years of age we have an altogether different state of affairs. But twelve were fractures of the clavicle, three fractures of the condyles of the humerus, and twenty-four fractures of the lower end of the radius. It seems to me important to give a minute description of the kind of fracture as well as of the location, otherwise, in recommending any particular splint or plan of treatment, we may easily mislead the more inexperienced of our profession

and thus have a valuable aid in the treatment of those injuries deemed unworthy of a second trial; and therefore it is that I ask your indulgence while I refer to some of the peculiar characteristics of the more important fractures.

Fractures of the Clavicle.—Of the twenty-five fractures of the clavicle of children under twelve years of age, twenty-two were transverse or short oblique, having the line of fracture near the outer edge of the middle third, with only slight displacement of the fragments. In some, there being no displacement, the periosteum evidently not having been torn through, the only evidence of fracture was a false point of motion and crepitus; while in the other three cases the fractures were near the middle of the bone, and long oblique in character, with considerable displacement and deformity. Of the eight fractures of persons between twelve and fifty years of age, three resulted from great violence to the upper and outer portion of the shoulder, the line of obliquity commencing near the inner edge of the middle third and running from above downward and inward, developing great displacement of the fragments with much deformity; the outer fragment being drawn downward and inward, so that it lay under and crossed the inner fragment like the letter x. [I think, when this particular kind of obliquity occurs, it is due to the clavicle being forced down across the first rib.] The other five fractures resulted either from a fall on the hand with the arm extended from the side, or a fall on the outer portion of the shoulder. Of these, three were long oblique, the line of obliquity running from the outer portion of the middle third backward and inward, having much less deformity and displacement than obtained in the three cases before mentioned. One was transverse or short oblique near the outer edge of the middle third, with very little deformity, the other being transverse outside the coraco-clavicular ligament, with considerable displacement and dropping of the shoulder. The remaining four cases of persons over fifty years of age, resulted from a fall on the hand while the arm was extended from the side, or from a fall on the outer portion of the shoulder; all were in the middle

third, running obliquely backward and inward. In all of these cases, just as the fractures occurred within the attachment of the subclavius muscle, it became likewise difficult to overcome its tendency to draw the outer fragment inward and forward.

Fractures of the Humerus.—At present I will speak only of those at the lower end of this bone. In speaking of these fractures, please understand me as referring to the condyles or separation of the epiphysis. That such are not infrequent, especially between the ages of six and twelve, is shown by the above table. Of eleven fractures of the condyles of the humerus two occurred in children under six years of age, one of the external and one of the internal condyle; six occurred between the ages of six and twelve; of these one one was of the epicondyle, two of the external condyle, two of the internal condyle, and one of both condyles, or the so-called T-fracture. Three occurred in persons between the ages of twelve and fifty years; of these, one was of the epicondyle, one of the external condyle, and one of both condyles, or the so-called T-fracture.

Fractures of the lower end of the Radius.—I will not occupy your time in reviewing the more simple fractures of the ulna and shaft of the radius, but will confine my remarks to the fracture of the lower end of the radius—the so-called "Colles fracture." And here a word explanatory of my understanding of a "Colles fracture," for I concede a marked difference between a "Colles fracture" and a transverse or short oblique fracture, which latter has not, under my observation, given rise to the characteristic deformity so particularly described by Mr. Colles, except when we have the fracture transverse through the more cancillated structure of the bone, with the lower fragment splintered and impaction of the upper fragment. All the text-books on surgery which I have consulted omit mention of the peculiar obliquity of this fracture. Mr. Colles' own description in the *Edinburgh Medical and Surgical Journal*, vol. x., p. 182, 1814, deals more particularly with its characteristic deformity and cause, without referring to the degree of obliquity. Prof. Alexan-

der Gardner, of Queen's College, Belfast, in his treatise on "Fractures of the Lower End of the Radius and Clavicle," in 1875, says: "In justice to the man who first described this fracture, we should restrict ourselves to the form or variety which Mr. Colles described." He then asks, "Is the fracture transverse?" and says, "Of twenty-seven specimens examined, nineteen were oblique from before backward, and eight directly transverse," and again asks, "If the transverse fractures had been examined immediately after the accident, would they have been considered directly transverse?"

Erichsen, in his work on Surgery, vol. i., p. 420, says: "Colles' fracture is generally oblique from before backward;" and again, page 421, that a patient died in the hospital twelve days after receiving a "Colles fracture," the wrist presenting the characteristic deformity in a marked degree; and that he made a dissection of the limb and found the line of fracture transverse and about an inch above the articular surface, with impaction of the upper fragment, the lower fragment being somewhat comminuted.

Prof. E. M. Moore, of Rochester, in his very able paper read before the New York State Medical Society, and published in The Medical Record, vol. xvii., p. 305, 1880, says, "the fracture is usually oblique." But he fails to describe the special character of the obliquity, and recommends the following treatment, viz.: A small roller or compress under the ulna, and over this and around the wrist, tightly drawn, a few turns of adhesive plaster, about two inches wide, and says that the best results are obtained thereby. This may be so in Dr. Moore's hands, but it utterly failed in mine, except in cases of the short oblique or transverse fracture, without impaction, when I obtained as good results as with any other splint. It was during a trial of Dr. Moore's splint in the treatment of these fractures, that I recognized a marked distinction between long obliquity and short or transverse fracture. However, when we have a short oblique or transverse fracture within an inch of the carpal articulation, and a comminution of the lower fragment with impac-

tion, then we have a shortening of the radius, the carpal end of the lower fragment with the carpal bones being drawn backward, the hand also drawn outward and presenting the characteristic deformity described by Mr. Colles. The kind of splint used and the after-management of the case should, therefore, depend largely upon the fact whether the obliquity of the fracture be long or short; and for this reason we have the action of the supinator longus with the extensors constantly drawing the lower fragment upward, and its carpal end with the carpal bones backward and the hand outward, which gives rise to the posterior deformity and appearance of dislocation of the ulna. Hence, as the obliquity is great, the difficulty of retaining the fragments in apposition after reduction is correspondingly great, and, by the drawing upward of the lower fragment, we have a shortening of the radius, giving rise to the unnatural convexity over the head of the ulna so common after treatment of these fractures. Dr. Moore, however, claims that the inner deformity over the head of the ulna is due to the giving way of the internal lateral ligament and the triangular fibro-cartilage, the styloid process and sometimes the head of the ulna being thrust through the annular ligament. This may or may not be the case, and is difficult of demonstration. Through the kindness of Dr. Dennis, I was shown a remarkable specimen of so-called Colles' fracture, with dislocation of the ulna, the head of the bone tearing through the annular ligament. This specimen was taken from a woman who had thrown herself head foremost from a third-story window, striking upon her hands. The force of the blow was greater than is necessary to produce a Colles fracture, hence the driving of the head of the ulna through the annular ligament and the comminution of the lower fragment of the radius.

In speaking of these fractures I will use the term Colles' fracture only where the fracture was of the long oblique variety, and gave rise to the characteristic deformity as described by Mr. Colles, and use the words short oblique or transverse where the fracture occurred in the same location, with the deformity less marked, and after the fragments had

been brought into apposition, were easily held in their natural position.

There are in my list twenty-five fractures of the lower end of the radius. Of these, two occurred to children under twelve years of age, one of which was transverse, and one a separation of the epiphysis with no deformity. Eleven cases were between the ages of twelve and fifty years. Of these, eight were short oblique or transverse with some deformity, and three were Colles' fractures, deformity well marked. Twelve occurred to patients over fifty years of age, and of these two were short oblique or transverse, with considerable of the characteristic deformity of Colles' fracture, but easily reduced and readily held in position. The remaining ten were Colles' fractures, the characteristic deformity being well marked in all of them.

Treatment.—I will not occupy your time in reviewing the various splints and devices for the treatment of these fractures. Professor F. H. Hamilton, in his treatise on "Fractures and Dislocations," page 194, says of the number of splints and devices for the treatment of the fractured clavicle: "A catalogue of the names only of the men who have upon this simple point exercised their ingenuity, would be formidable, nor would it present any mean array of talents and of practical skill." As much may be said relative to the number of splints and devices for the treatment of fractures of the condyles of the humerus and the lower end of the radius.

The main object to be obtained in the treatment of fracture of the clavicle is to lift the shoulder upward, outward, and backward, and to hold the fragments in apposition. The two splints most commonly used for this fracture are, on the Continent, Desault's, with the axillary wedge, and in this country Professor L. A. Sayre's adhesive plaster splint, and, to some extent, Professor E. M. Moore's shawl or elbow figure-of-eight splint. With these I will briefly compare my splint for fractured clavicle. In the use of Desault's splint for oblique fracture near the inner third of the clavicle, I have never been able to throw the shoulder sufficiently out-

ward to overcome the deformity without seriously interfering with the circulation of the arm, though the forearm, from the fingers to the elbow, be bandaged. Cases are reported where paralysis was caused by the pressure of the wedge upon the brachial plexus. Professor Sayre's splint, properly applied, will overcome any of the ordinary results of an oblique fracture in the middle third, where the obliquity is from before backward; but where the bone is fractured in the great convexity and the obliquity is downward and inward, I have found it insufficient to overcome the deformity, and have also found it to interfere with the circulation of the arm. Its greatest objection, however, is the irritation of the skin by the adhesive plaster, which in some cases, especially those of young children, excoriates and results in superficial ulceration to such a degree, that several times I have felt obliged to remove the splint in less than a week from its application.

Professor Moore's figure-of-eight splint was an advanced step, and answered the purpose only where the fracture was near the outer edge of the middle third, and transverse or short oblique in character; but where the fracture is near the inner third and long oblique it does not answer its intended purpose, but does the very opposite, for, passing the end of the shawl backward over the shoulder, it presses the outer fragment downward, rather than hold it up in apposition with the inner fragment. Nor does it suffice to draw the elbow backward and inward enough to overcome the action of the subclavius muscle, which, in my opinion, is one of the main factors in drawing the outer fragment inward. This led me to carry Dr. Moore's idea a step farther, by making a clove hitch with a scarf around the forearm well up to the bend of the elbow, passing the loose ends across the back and over the uninjured shoulder. This enabled me to draw the elbow of the injured side farther backward, inward, and upward, and make the humerus a lever and the side of the chest a fulcrum by which I could lift the shoulder of the injured side upward, throw it out, and draw it backward. I then could completely overcome the action of the

subclavius and other muscles of the shoulder, and also that of the sterno-cleido-mastoid by tension upon the pectoralis major, fixing the scapula and firmly holding the fragments in apposition without at any time interfering with local circulation. This is what is desired from any splint for this fracture.

FIG. 1.

CASE II.—*Transverse or short oblique fracture of the clavicle, near the outer edge of middle third.*—Kate B ——, aged eighteen months, on December 10, 1879, was sent to me from the eye class by Dr. Carey, of the Demilt Dispensary. She was suffering from fracture of the clavicle. The patient had fallen from the bed and struck upon the left shoulder. She cried somewhat, but as she had at the time a deep ulcer from vaccination upon the arm of the injured shoulder, the mother had thought nothing of the accident until she had noticed a black and blue spot over the clavicle. On exami-

nation I discovered a transverse or short oblique fracture near the outer third of the clavicle, upon the same side of the body as the ulcer from vaccination. To apply either the Sayre adhesive plaster splint or the axillary wedge splint was out of the question. Hence, as was suggested to me by the article of Dr. Moore, of Rochester, in relation to the use of a shawl for holding up the shoulder, I improvised a splint. I used a scarf of unbleached cotton, six inches wide by four yards long, and made a clove hitch around the forearm, near the elbow, which was well padded. I was enabled, by drawing the elbow backward, upward, and inward, to throw the shoulder outward and upward, and draw it backward. I passed the two ends of the scarf around the uninjured shoulder and fastened it with a safety pin, bringing the loose ends across the uninjured side of the shoulder, to form a hand-sling. I was thus enabled to completely readjust the fracture and keep the broken fragments in apposition. The patient wore the splint for three weeks without complaint or any evidence of injury to the arm. At the end of that time I removed it, and found the fragments firmly united, without deformity.

In some of the following cases I used Sayre's splint, in others my own. The results in every case of using my splint, whether for oblique or transverse fracture, were equally as good as where Professor Sayre's splint was used, and with no discomfort from confining the forearm across the chest, and without the excoriation and superficial ulceration so apt to follow the use of the adhesive plaster splint, to say nothing of its want of cleanliness and danger of slipping due to the perspiration.

After a fair trial of my scarf splint on the more severe fractures of the clavicle, where the obliquity was downward and inward through the great convexity of the bone, I abandoned all other splints and confined myself to the use of my scarf splint, until I had made one more satisfactory in obtaining a fixation of the fragments with the elbow in the same position.

It is for this fracture, oblique, downward, and inward, and through the great convexity of the bone, that I claim for my new splint for fracture of the clavicle all the advantages of

any other, as well as some advantages that no other splints have.

This splint is very simple, easily made, and not expensive. It is a padded, gauntlet-shaped piece of leather, laced to fit the forearm, running on either side back of the bend of the

FIG. 2.

elbow. To this part is attached a strap and buckle. A padded collar with strap, buckle, and ring is fitted to the uninjured shoulder. Through this ring the strap from the elbow piece passes, and by tightly drawing this strap the arm of the injured shoulder is under sufficient control to bring the fragments into perfect apposition. A sling is made to pass from the ring of the collar on the uninjured side of the neck for the hand of the injured side.

CASE LIX.—*Long oblique fracture of middle third of clavicle, treated by backward position of elbow, and cured without*

deformity.—John M——, aged seven years, in April, 1884, was brought to the dispensary by his mother, who informed me that her little boy, while climbing over a fence the day before, fell eight or ten feet headlong to the ground. Since then he had been unable to use his left arm. It hung like a dead weight by his side, the shoulder having dropped downward, forward, and inward to a very remarkable degree. The arm rotated, as it were, around in front of the chest. Examination showed a long oblique fracture near the inner edge of the middle third of clavicle, the obliquity running from above downward, inward, and backward. The patient was thin in flesh, and the line of obliquity was readily mapped out. The application of my scarf bandage splint did not seem quite satisfactory for holding the fragments in perfect apposition, as the adjustment is not so easily made as with my gauntlet and collar splint. By the application of this splint the broken fragments were held in apposition for three weeks, when I removed the splint. I found the broken bone firmly united, without any deformity or perceptible shortening of the clavicle.

CASE LXXXIII.—*Long oblique fracture of clavicle at inner edge of the middle third; obliquity running from above downward and inward.*—John F——, aged thirty-nine years, in January, 1884, came to the dispensary for advice in relation to a fracture of his right collar-bone, received three or four days before. He informed me that, while at work in a lumber yard, he and another workman were carrying a long, heavy piece of lumber; that the other man, who was in front of him, fell, dropping his end to the ground. The force of the plank's fall was communicated to Mr. F.'s shoulder, upon which rested the other end of the plank. The arm of the injured shoulder dropped by his side, and his end of the plank fell to the ground. Two days after he went to a college clinic, where a Sayre adhesive plaster splint was applied, and over this was placed a Velpeau bandage. When he presented himself at the dispensary he also complained of numbness in his hand and arm, as well as pain. I removed the bandage and found the splint in proper position for fracture of the clavicle. On examining the injury I found it to be a long, oblique fracture of the middle of the clavicle, the obliquity running from above downward and inward. The fragments were over-riding each other, and their long axes crossing like the letter X. They presented sharp points to the skin at two different places,

so that the fragments were far from being apposed in their natural position. I removed the Sayre splint and applied my splint, drawing the elbow backward and inward, as in Case LIX. With the elbow in this position I was able to entirely overcome the deformity of the fragments, bringing them into apposition and holding them there. At the end of three weeks firm union had taken place. The split was worn for a week longer, and I removed it and discharged the patient cured, with little or no deformity.

CASE C.—*Long oblique fracture of the middle of the clavicle cured without deformity.*—Jesse F——, aged ten years, was brought to the Demilt Dispensary in September, 1885, by his mother, for treatment of an injury to the right shoulder. The patient informed me that while playing on the sidewalk, the day before, a boy pushed him down, the outer edge of his shoulder striking against a stone step, since which time he was unable to use his arm. The arm hung helpless by his side with the hand and forearm in a state of pronation in front, the shoulder considerably lower, and a shortening of the clavicular line as compared with the uninjured side. Examination showed that the injury sustained was that of a long oblique fracture near the inner edge of the middle third of the clavicle. The second day following the injury I applied my splint for fracture of the clavicle. With it I was enabled to bring the fragments in apposition and hold them firmly until consolidation took place. The splint was worn with little or no discomfort for three weeks. The result, a cure without deformity.

Fractures of the condyles of the humerus.—It is admitted that injury to, or fracture of, the elbow is a serious matter, and the result thereof is largely dependent upon appropriate local treatment and care. But when the line of fracture of either condyle of the humerus runs into the joint it is doubly serious, and has thoroughly tested the ingenuity and skill of our profession, not a few of whom have been prosecuted because of a resultant stiffened joint or the so-called gun-stock deformity remaining after treatment was discontinued. This fracture is generally caused by direct violence with much injury to the soft parts; hence, it is of special importance in treating it to use means that will most effectually promote the absorption of the resulting inflammatory pro-

ducts in and around the joint, as well as the speedy coaptation of the fragments and the holding of them firmly in apposition.

My experience in treating injuries of the elbow-joint, whether fracture obtained or not, has taught me that prompt and vigorous treatment, to combat local inflammation with effusion in and around the joint, and appropriate treatment for its reabsorption, is our only safety from false anchylosis or stiffened joint, so commonly resulting from these injuries, and so annoying to the surgeon as well as painful to the patient.

The splints generally used are the posterior, anterior, and the internal lateral angular, with or without movable joints, and each one is recommended by equally good authorities. Each has advantages and disadvantages, but, as Dr. Alis, of Philadelphia, states, none can be firmly enough applied to fix the joint without interfering with the perfect coaptation of the fragments; hence the loss of the so-called carrying point, besides the interference with local applications, which are so important in the early as well as the later treatment of these injuries.

Dr. Alis recommends semi-extension of the arm with a simple splint of flour paste or strips of adhesive plaster. Here, again, local treatment is obstructed, and I consider flour paste or adhesive plaster insufficient to hold the fragments in apposition, especially where the line of fracture is through the external condyle into the joint. At least it has proved so in my hands.

In fractures of the external condyle I have preferred the internal lateral splint, with the forearm in a state of semi-extension and the hand in a state of supination.

In cases of separation of the epiphysis I have given preference to the long anterior leather splint, extending from the shoulder to the hand and applied with the forearm in extension, then flexed to a right angle. With all of these fractures, and especially the so-called T-fracture, none of the splints in common use gave me entire satisfaction in preserving the lateral angle of the arm, so essential in re-

taining the carrying point and preventing the gunstock deformity—a deformity that seriously lessens the ability to use the limb for any work, especially carrying a weight by the side, to say nothing of the special distress the deformity causes to women.

CASE XII.—*Fracture of the external condyle of the humerus; treated with the internal lateral angular splint, resulting in the loss of the "carrying point" with gunstock deformity.*—Geo. H——, aged twenty-three years, in June, 1880, came to the dispensary complaining of a painful injury to his right elbow. Two days before he had been knocked down by a rapidly moving express wagon. He thought the horse had stepped on his arm. Examination showed that much injury had been done to the soft parts. Swelling was very great, and the skin was blackened from extravasation of blood on the outside of the lower end of humerus. The fragment of the condyle was drawn down, so that the lateral angle of the arm was reversed. By flexing the forearm and restoring the external lateral angle crepitation was readily obtained. The patient was confined to his bed for the next two days, and evaporating lotions, alternated with hot poultices, continually applied. It was impossible to keep the patient in bed longer, the swelling having greatly subsided. The natural contour of the arm was restored, and the broken fragments were nicely coaptated. The forearm was flexed to nearly a right angle, causing but little pain, and dressed with an internal lateral splint, with an opening for internal condyle. The patient was seen every second day at the dispensary for the next ten days, when the splint was removed and reapplied, and passive motion commenced on the tenth day. Although but little movement of the forearm could be made without causing severe pain, by the daily application of hot poultices to the elbow, at the end of four weeks from the first removal of the splint, sufficient extension of the forearm could be made to show that the externallater angle of the arm, as well as the "carrying point," was lost. Patient continued to visit the dispensary, irregularly, for five or six months, but was never able to fully extend the forearm.

CASE XIII.—*Fracture of internal epicondyle; treated by position without a splint, and cured at the end of four weeks without any stiffness of the joint.*—John E——, aged fourteen years, in June, 1880, came to the dispensary for advice in

relation to a severe injury he had received to his left elbow. He informed me that while leaving the school-room a few hours before, he was shoved by another boy and fell, striking his elbow against the edge of a stone step. Examination showed a swelling on the inside of the elbow-joint, with a slight abrasion under the epicondyle. By extension and supination of the forearm, with my fingers pressed against the condyle, crepitus was readily felt. A further examination showed that the epicondyle was broken off and slightly drawn downward; there was no other deformity, comparing the injured with the uninjured arm, and my diagnosis was a simple fracture of the epicondyle. I sent the patient home and had him confined to bed, the arm resting upon a pillow, flexed and pronated in the most comfortable position to him, and ordered cold applications to be kept to the elbow for forty-eight hours. On the third day following I called at the house of the patient, and although cold applications had been faithfully applied, I found the elbow and forearm enormously swollen, and a large spot over the internal condyle red and hot to the touch. The patient complained of a good deal of pain whenever the arm was moved. Tongue furred; temperature in the axilla, 101.5 degrees. I prescribed a mild cathartic, to be followed by a few doses of liquor ammonia acetatis, and locally a lotion of lead and opium, over which hot poultices of flaxseed-meal to be changed every two hours. On the second day following I called to see the patient, and found him much improved. The swelling had noticeably subsided, and the redness had quite disappeared. I now ordered an evaporating lotion to be applied to the swollen joint, and alternated with hot poultices, the patient to be kept in bed.

This plan of treatment was followed up for ten days, when I commenced passive motion, moving the joint but little at first, and increasing the degree of flexion and extension each day, and continuing the local treatment as well, until, at the end of four weeks, I discharged the patient cured, with perfect use of the joint. There was no deformity, no swelling around the joint, and full extension and flexion existed without pain or stiffness of the joint.

CASE LVI.—*Fracture of lower end of humerus; treated with a long anterior leather splint.*—Edward G——, aged six years, was brought by his mother to the dispensary, in

March, 1882, for advice. She informed me that while the children were out playing upon a pile of boards the day before, her little boy was thrown off, some boards falling upon him. He was carried into the house, and when his left arm was moved he cried out with pain. The arm, at the elbow, was very much swollen, and black and blue to a considerable

FIG. 3.

extent. It hung by the side, with the forearm extended, and midway between pronation and supination. There was very little pain, except when attempt was made to flex or rotate the forearm, and then it was very great. I put the little patient under ether, and carefully made an examina-

tion. On manipulation of the elbow, crepitus was readily obtained. The fracture was through both condyles, extending into the joint. The lower fragments were pulled backward; otherwise the position of the arm appeared normal. I had the little sufferer confined to bed, with the arm resting upon a pillow, and treated with evaporating lotions, alternated with hot applications, for the next three days. Four days after injury, the swelling having very much subsided, the fragments were more easily made out, confirming my former diagnosis. I now applied a long anterior leather splint, extending from the shoulder to the wrist, and held in place by adhesive plaster; then gently flexing the forearm, I was able to bring the broken fragments into natural position. A roller bandage was now applied over the splint from hand to shoulder. The splint was worn for four weeks, but was removed every three or four days to permit examination of the position of the broken fragments. At the end of three weeks passive motion was commenced. The splint was left off, permanently, at the end of four weeks. Passive motion continued daily until the end of two months, when I discharged the patient cured, with full extension and flexion of the forearm, but with some gunstock deformity, the external fragment having been pulled downward by the application of the roller bandage, holding the splint in place with the forearm flexed.

A varied experience, full of disappointments, in the use of the known splints for the more severe fractures of the condyles, set me to work to make a splint with the following requisites:

1st. To hold the fragments in apposition.

2d. To allow the forearm to be flexed or extended, pronated or supinated, with fixation at any point.

3d. To lengthen or lessen the external lateral angle of the arm with fixation.

4th. To leave the entire elbow-joint exposed for local treatment, during the whole time of wearing the splint, without disturbing it.

The result of this work was a splint that my practice has proved to most happily meet every requisite mentioned.

CASE LXXI.—T-*fracture of both condyles of lower end of humerus; treated by my elbow splint, and cured without de-*

formity and with perfect use of elbow-joint.—William M——, aged eight years, in January, 1883, was brought to the dispensary by his mother. He was suffering intense pain from an injury to his right elbow-joint received the day before. His mother informed me that he had been knocked down by a horse and express wagon, falling forward on his face. The wheel of the wagon passed over his elbow. When I first saw the patient at the dispensary there was very much swelling about the joint, and the pain was so great that it was impossible to make out the extent of the injury without administering ether, which I did. The examination showed that both condyles were broken through into the joint, and could be moved upon themselves as well as upon the shaft of the humerus. The deformity was not great, except in the reversing of the outer lateral angle of the arm. The elbow was drawn somewhat backward, with the fragments

FIG. 4.

tilted forward, resembling a partial dislocation of the forearm backward. I applied my elbow splint, bringing the arm into semi-extension and restoring the natural lateral angle of the arm, with the hand midway between pronation and supination. By passing a roller bandage around the rods of my splint and under the lower part of the arm and elbow, I was enabled to form a cradle for resting this part of the arm and for holding the fragments more firmly in position. I now sent the patient home and had him confined to bed with his arm resting upon a pillow. Made local applications of hot poultices, alternating with evaporating lotions. There was a considerable elevation of temperature, with coated tongue, etc. Gave a mild calomel and jalap purge, and ordered a milk diet. On the second day following I visited

the patient at his home and found him in a much improved condition. The swelling around the elbow-joint had greatly subsided, and the pain was much lessened. I could now ascertain the extent of the injury, which confirmed my former diagnosis. The same treatment was continued for three or four days longer, when I commenced flexion of the forearm. At the end of ten days I flexed the forearm to nearly a right angle with the arm, not, however, without causing some pain. With the forearm flexed, and midway between pronation and supination, I fixed my splint, which was held with a sling from the neck, and allowed the patient to leave the bed and take exercise out of doors. At the end of two weeks passive motion was commenced and kept up daily. The arm was held alternately by my splint at the fullest point of extension and of flexion, as seemed most adapted to overcome the stiffness of the joint. Thus the splint was of much value in preserving the natural contour of the arm, as well as in holding the forearm fixed at the farthest point gained in either flexion or extension, until I again saw the patient. At the end of two months I removed the splint altogether. The forearm could be flexed and extended to a degree almost equal with the uninjured arm. Hot poultices were applied to the elbow at intervals of two or three days during this period, and I consider their application a great factor in the restoration of the mobility of the injured joint. I saw the patient for the last time at the dispensary three months after the injury. He had the power of full extension and flexion of the forearm, with no loss of the so-called "carrying point," and with no "gun-stock" deformity.

My splint is made with two rods of untempered steel, extending from the upper part of the arm to the wrist, with a ball and socket joint at the elbow, and screws for fixation; the lower ends pass into a sheath-screw on either side of the wrist; the upper ends pass through two iron posts set in tin and made fast to the arm by plaster-of-Paris bandages, the rods being made firm in the posts by thumb-screws. On each side of the wrist is a post through which the sheath-screw passes, and made fast to the wrist in the same manner as the upper parts, and fastened with fixation-screws. By moving the sheath-screws the lateral angle of the arm may be contracted or widened as needed, thus overcoming any

tendency to loss of the carrying point (or gunstock deformity). A turn of the fixation-screws at the elbow and wrist will allow the forearm to be flexed, extended, pronated, supinated, and fixed at any desired point without other interference with the splint.

PASSIVE MOTION.—Recognized authorities, of like high standing, differ materially as to the time when passive motion should be commenced.

While some advise commencing passive motion within a week of the injury, others say that under no circumstances should it be commenced before three to five weeks. My opinion is that passive motion should be commenced in each case according to the extent of injury to the soft parts, and our ability to hold in check and reduce the inflammation following the injury. Thus, while passive motion might be wisely commenced within a week of the injury in one case, in another it would be better surgery not to commence for three or four weeks.

COLLES' FRACTURE.—Not having as yet treated a sufficient number of Colles' fractures by my new extension splint to draw conclusions satisfactory to myself, I will leave the discussion of its application to these fractures for a future paper.

I will briefly say, however, that whether the fracture be transverse near the carpal articulation, with splintering of the lower fragment, or a long oblique higher up, the treatment is necessarily the same ; that is, we make extension of the hand, drawing it well toward the ulnar side, and the deformity is reduced. The application of any splint in common use is to retain the fragments in their natural position by forcible compression, and the daily removal of the splint to renew extension if we would secure repair of the fracture without deformity. I have undertaken to do this by making the hand and forearm the points of resistance to overcome the natural tendency to a shortening of the radius, which tendency is, in my opinion, so powerful, so constant and vigorous in action, that it is the cause, more than any other, of the unsightly convexity over the head of the ulna.

I cannot close this paper without protesting against allowing any splint whatever being kept without removal on a Colles fracture for two or three weeks at a time, or even three days. My plan has been to remove the dressing for examination of the injury every second day, until consolidation of the fragments is obtained. To support this protest I will read you Case XCIX.

CASE XCIX.—"*Colles' fracture;*" *treated by permanent splint; deformity and a crippled hand resulting therefrom.*—Mrs. G——, aged sixty-nine years, called at my office in October, 1884, to consult me in relation to a stiffness of her left hand and wrist accompanied by extreme pain. Patient gave me the following history: Three months previous, while descending the stairs, and when within three or four steps of the bottom, her heel caught on the edge of the step, throwing her forward to the floor. She fell on her left hand outstretched in front of her. A physician was called in to attend her within an hour after the injury. He said it was a "Colles' fracture," applied temporary dressing, and called the following day in company with a surgeon. After examining the fracture together a splint was applied, and left in position for two weeks, then removed and a plaster-of-Paris splint was put on, leaving it in position for six weeks longer. The result of this treatment, in this case, is a deformed wrist and crippled hand.

But, after all, this cast (cast shown) not only makes a stronger and more eloquent protest than can any words of mine, but also makes an appeal to every surgeon faithful to his human work.